In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

General Contract Package with Photos
Phase 2 Construction

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)))))))))	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix A – General Arrangements

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)))))))))	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix B – Process and Instrumentation Diagrams and Process Flow Diagrams

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

Big Rivers
ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix C – Rev 2

Civil Specifications

(No updates to any documents since Rev 0 Package)

Appendix	Document Number	Document Title	Document Revision
C	143993-ASA-DD1-SPC-1410	FACILITY WATER DISTRIBUTION PIPING - CONSTRUCTION SPECIFICATIONS	0
C	143993-ASA-DD1-SPC-1411	EARTH MOVING - CONSTRUCTION SPECIFICATIONS	1
C	143993-ASA-DD1-SPC-1412	ASPHALT PAVING - CONSTRUCTION SPECIFICATIONS	0
C	143993-ASA-DD1-SPC-1415	STORMWATER CONVEYANCE - CONSTRUCTION SPECIFICATIONS	1
C	143993-ASA-DD1-SPC-1416	FACILITY SANITARY SEWER - CONSTRUCTION SPECIFICATIONS	0

CONSTRUCTION SPECIFICATIONS

wood.
DOING BUSINESS AS WOOD GROUP USA, INC.

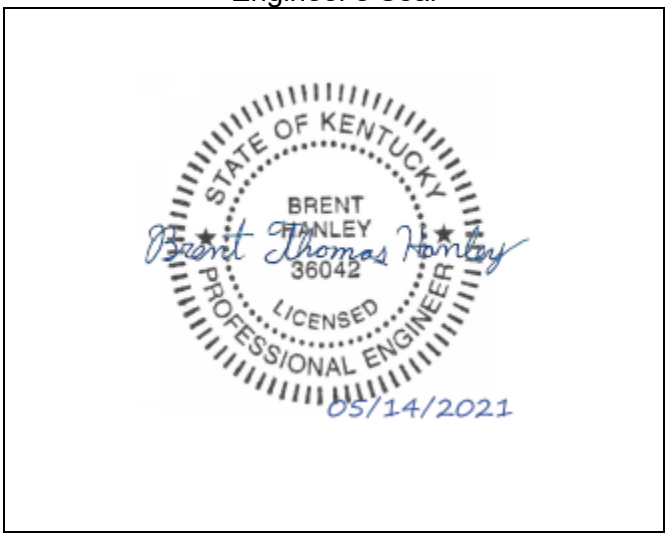
TITLE: Facility Water Distribution Piping	**143993-ASA-DD1-SPC-1410**
PROJECT: D.B. Wilson FGD Replacement	REV: 0
LOCATION: Centertown, KY	PROJECT NO. 245891

CLIENT:	Big Rivers Electric Corporation	AREA NO.:	-

APPROVAL STATUS							
PREPARED BY:	LJN	DATE	15FEB21	APPROVED BY:	BTH	DATE	05MAR21
CHECKED BY:	BTH	DATE	13MAY21	APPROVED BY:	NDH	DATE	05MAR21

REVISION STATUS						
REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	KAV		BTH	NDH	05MAR21
0	CONSTRUCTION	KAV	BTH	SJS	NDH	14MAY21

Engineer's Seal



SECTION 1410 - FACILITY WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This section includes water-distribution piping and related components outside the buildings for underground fire-service and potable water mains.

B. Related Requirements:
1. 143993-ASA-DD1-SPC-1411 – Earth Moving
2. 143993-ASA-DD1-SPC-1416 – Facility Sanitary Sewer
3. American Society for Testing and Materials (ASTM) Standards, latest revision
4. American Water Works Association (AWWA) Standards, latest revision
5. National Fire Protection Association (NFPA) Codes and Standards, latest revision

1.3 DEFINITIONS

A. Engineer:

Wood.
(Doing business as Wood Group USA, Inc.)
30 Patewood Dr., Suite 200
Greenville, SC 29615

B. Owner:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328

C. AHJ: Authority having jurisdiction.

D. FMG: Factory Mutual Global.

E. DIP: Ductile Iron Pipe

F. PVC: Polyvinyl chloride.

G. NFPA: National Fire Protection Association.

H. HDPE: High Density Polyethylene.

I. UL: Underwriter's Laboratories

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with standards of AHJ for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with ASTM F645 for selection, design, and installation of thermoplastic water piping.

D. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

F. The completed work shall be inspected and approved by the Owner's insurance underwriters and Owner's representative. The Contractor shall notify the Owner's representative and the insurance underwriters seven calendar days in advance prior to completion and testing

1.8 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves to the following:
1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves according to the following:
1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.9 FIELD CONDITIONS

A. Interruption of Existing Water Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of service. For fire water service interruption, notification to AHJ shall be included (as applicable).
   2. Do not proceed with interruption of water-distribution service without Owner's and AHJ's (as applicable) written permission.
   3. Provide temporary service, fire watch, and other measures as may be required by Owner and/or AHJ during service interruption.

1.10 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS – FIRE WATER

A. PVC, AWWA Pipe: AWWA C900, DR14, with bell end with gasket.
   1. Comply with UL 1285 for underground PVC fire-service mains.
   2. Mechanical-Joint Restraint for PVC Pipe, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

      a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Only FMG approved fittings may be used for fire water piping.

C. Contractor shall submit vendor and material information for approval to Engineer, following Engineer's specified procedures, prior to ordering any materials.

2.2 PVC PIPE AND FITTINGS – POTABLE WATER

A. PVC Piping:

1. Pipe: ASTM D1785, IPS Schedule 80 PVC, with plain ends for solvent-welded fittings.
2. Fittings: ASTM D2467, Schedule 80 PVC, socket type.
3. All piping and fittings shall be rated for a minimum working pressure of 150 psig at 73°F based on field testing to be performed by the contractor to confirm existing system pressure is not in excess of 150 psig.

2.3 HDPE PIPE AND FITTINGS

A. Underground piping and fittings shall be made from a high density, extra high molecular weight material. Piping and fittings shall be designated as IPS, PE 4710, SDR 11 (potable water), with a cell classification of 445574C per ASTM D3350. Potable water piping and fittings shall be rated for 160 psig minimum working pressure based on field testing to be performed by the contractor to confirm existing system pressure is not in excess of 150 psig.
   1. All pipe shall be made from virgin material.
   2. Pipe shall be manufactured according to ASTM F714.

B. Molded HDPE fittings shall conform to the following requirements:

   1. Elbows, straight and reducing tees, reducers, and stub ends shall be factory-fabricated with plain ends for butt fusion per ASTM D3261.
   2. Molded fittings shall be manufactured to ASTM D3350.
   3. Where specified, flange adaptors shall be HDPE molded flange adaptors with ductile iron convoluted flange/backup ring.
   4. Installation guidelines shall follow manufacturer's recommendations unless stated otherwise.

C. Fabricated fittings shall not be used without prior approval from Engineer. Where approved for use, fabricated fittings shall be rated for 250 psig minimum working pressure.

D. Contractor shall submit vendor and material information for approval to Engineer, following Engineer’s specified procedures, prior to ordering any materials.

E. HDPE pipe and fittings to be joined by heat fusion shall be produced by the same manufacturer.

2.4 JOINING MATERIALS

A. Plastic Pipe-Flange Gasket backup ring, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

B. Mechanical Joint Restraint for PVC pipe and ductile iron pipe with gasket, lubrication, and bolting hardware by piping system manufacturer, unless otherwise indicated.

C. All fittings and joining materials shall be FMG rated and meet the minimum pressure rating of 200 psig for fire water piping.

D. Restraint Harness for AWWA C900 PVC pipe shall be manufactured of ductile iron conforming to ASTM A536 and coated to prevent corrosion. The combination of the restraint(s) and fasteners shall have a pressure rating as listed herein. The restraint shall have a two to one safety factor. Restraint harness shall be Ebaa Iron Series 1900 or approved equivalent.

E. HDPE Mechanical Joint Adapters

1. Manufactured adapters shall be FMG approved and shall be the same size as, with pressure rating at least equal to and ends compatible with, piping and appurtenances to be joined. HDPE mechanical joint adapters shall be furnished with stainless steel stiffeners.

2.5 TRANSITION FITTINGS FOR POTABLE WATER

A. Where connecting new PVC to existing PVC, pipes shall be joined using transition fitting, or an approved alternate method, and shall be rated for 160 psig minimum working pressure based on field testing to be performed by the contractor to confirm existing system pressure is not in excess of 150 psig.

2.6 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Mueller Company H-615 Tapping Sleeve or approved equivalent.
2. Description: Sleeve and valve compatible (Mueller Company T-2361 Resilient Wedge Tapping Valve or approved equivalent) with drilling machine.

a. Standard: MSS SP-60.

b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.
d. Tapping sleeve and valve shall be FMG rated for 200 psig working pressure.

2.7 GATE VALVES

A. UL/FMG, Ductile Iron Gate Valves: (Fire Protection System):

1. UL/FMG, Non-Rising-Stem Resilient-Seated Gate Valves:

a. Description: Ductile iron body and bonnet with flange for indicator post where specified, ductile iron seating material, and bronze stem.

1) Standards: UL 262 and FMG approved.
2) Minimum Working Pressure Rating: 200 psig.
3) End Connections: Mechanical joint, fitted with mechanical joint adapters at PVC pipe connections.

B. AWWA, Ductile-Iron Gate Valves (Non-Fire Protection System):

1. Non-rising-Stem, Resilient-Seated Gate Valves:

a. Description: Ductile-iron body and bonnet; with ductile-iron gate, resilient seats, bronze stem, and stem nut.

1) Standard: AWWA C509 or C515.
2) Minimum Pressure Rating: 200 psig.
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

2.8 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:

1. If new hydrant is required, it shall be in accordance with Owner and AHJ requirements. Contractor shall submit shop drawings to Engineer for approval.
2. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.

a. Description: Freestanding, with one 5 1/4-inch valve opening, two 2 1/2-inch hose connections.
b. Standards: UL 246, FMG approved.
c. Pressure Rating: 250 psig.
d. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
e. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
f. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
g. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.9 POST INDICATOR VALVE (PIV)

A. Valves shall be indicator post type, resilient seat, gray or ductile iron gate valves in accordance with AWWA C509, FMG approved, with mechanical joint ends and non-rising stem. Indicator post shall be the adjustable type complete with operating wrench. Operating nut shall be 1¼ inch square and shall open in the counterclockwise direction. Each indicator post shall be furnished with a “breakaway” padlock keyed to match the Owner’s indicator post padlock system and in compliance with local fire department requirements.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to specification 143993-ASA-DD1-SPC-1411, Earth Moving for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
1. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.
2. Do not use flanges or unions for underground piping.
3. Underground Fire-Service-Main Piping shall be the following:
a. PVC per Section 2.1.
4. Underground Potable-Water-Main Piping shall be the following:
a. PVC per Section 2.2.

b. HDPE per Section 2.3.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical joint end valves for underground installation. Use resilient-seated gate valves for installation with indicator posts, where specified.

3.4 PIPING INSTALLATION

A. Installation shall be in accordance with the AWWA C605, manufacturer's recommendations, and this specification.

B. All necessary precautions shall be taken to ensure a safe working environment in accordance with applicable codes and standards.

C. Water-Main Connection: Isolate water main per Owner's requirements and install pipe and fittings in location indicated.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.
1. Install PE corrosion-protection encasement according to ASTM A674 or AWWA C105.

F. Install PVC pipe according to ASTM F645 and ASTM D1784.

G. Install HDPE according to ASTM D2774 and ASTM F645.

H. Bury fire water piping with a minimum cover of 36 inches for all lines.

I. Install piping by direction drilling under streets and other obstructions that cannot be disturbed.

J. Refer to plans for horizontal and vertical separation requirements from other utilities.

3.5 JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D2774 or ASTM D3139 and pipe manufacture's written instructions.
2. Mechanical-Joint Restraint for PVC Pipe per AWWA C605.
3. Harness restraint for PVC Pipe per AWWA C900.

4. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
5. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

B. Heat Fusion Joining:
1. All joining of HDPE pipe and fittings shall be per ASTM F2620 and as recommended by the manufacturer.
2. Heat fusion joining and other procedures necessary for correct assembly of HDPE pipe and fittings shall be done by manufacturer-trained personnel using tools approved by the pipe manufacturer.
3. Joint strength must be equal to that of adjacent pipe.
4. External appearance of fusion bead shall be smooth with bead width in accordance with pipe manufacturer's recommendations.
5. A trial fusion shall be made each day to check required heating times for prevailing ambient temperatures and other weather conditions.
6. A pipe cutter shall be used for squaring pipe ends or a facing tool for joining.
7. Remove the sharp outer edge on the outside diameter surface on all pipe sizes for socket fusion joint.
8. Remove any burrs from inside of pipe ends. Both ends of pipe to be joined shall be clean, dry, and free of foreign substance.
9. Fusion machine shall be the type used for fusing pipe ends together.
10. The machine shall be equipped with a powered facing unit to prepare pipe ends.
11. Heating plate shall be electrically heated and thermostatically controlled having a temperature gauge to monitor temperature.
12. If pipe is to be joined prior to placing in pipe trench, the maximum length of pre-joined pipe shall be no more than 200 feet in length.
13. Direct burial: The temperature of the pipe shall be approximately the same as the soil at the installed depth before completing the tie-in.
14. At joints connected to piping systems or fittings of other materials by a flange assembly, the pipe adjacent to these joints shall be supported on either side of the flange assembly:
    a. For a distance of one pipe diameter, or
    b. Not more than 12 inches from joint, or
    c. Whichever is greater.

15. HDPE joints between plain end pipes and fittings shall be made by butt fusion or with electrofusion fittings, using only procedures that are recommended by the manufacturer.

16. The procedures and procedure qualification records must be reviewed by the inspector representing the Contractor before any heat fusion joining begins.

17. External and internal beads shall not be removed.

C. Heat Fusion Training:

1. Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure.

2. Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction.

3.6 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Restrained-joint types that may be used include the following:

1. Locking mechanical joints.

2. Restraint harness.

3. Thrust blocks.

B. Install anchorages for tees, plugs, caps, bends, and valves. Include anchorages for the following piping systems:

1. Gasketed-Joint assembly: According to ASTM D3139.

2. Fire-Service-Main Piping: According to NFPA 24.

C. Apply two full coats of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous materials.

3.7 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up with valve box or post-indicator as shown on the drawings.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

3.8 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.9 FIELD QUALITY CONTROL

A. Inspection:

1. Gasketed joint assembly shall be visually examined to ensure joint quality per manufacture’s recommendations.

B. Perform service test of tie-ins by monitoring connections under full system operating pressure for a duration equivalent to testing of the PVC.

C. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently.

D. Hydrostatic Tests: The testing in this section shall be limited to newly installed piping and appurtenances per this specification. Any additional testing, including testing of any existing system components included in the test sections, shall require coordination with the Engineer. For PVC fire water piping, test pressure at lowest element in system shall be 225 psig, adjusted as required such that maximum pressure shall not exceed 250 psig at gate valves. The test pressure shall be not less than 225 psig at the highest element of the test section. For HDPE potable water piping, test pressure at lowest element in system shall be 240 psig, adjusted as required such that maximum pressure

shall not exceed 250 psig at gate valves. All temporary and permanent pipe connections, fittings, or any other apparatus used during testing, shall be rated for a minimum pressure equivalent to the system test pressure. Install temporary blind flanges on air release vents during pressure test.

1. Follow all procedural and safety requirements as defined in ASTM F2164 for HDPE and ASTM D2774 and AWWA C605 for PVC. All apparatus, equipment, pre-test preparation, and set-up shall meet ASTM D2774 / AWWA C605 as applicable.
2. Use only potable water or water from the plant dedicated fire water system for filling of the test section. Fill the test section slowly. Purge all air. Take all appropriate precautions to ensure that no air is trapped in the test section.
3. Allow the test section and the test liquid to equalize to a common temperature. In cases where the temperature of the test section and test liquid is over 73°F, test pressure must be reduced per manufacturers recommendations.
4. Initial Expansion Phase: Increase pressure in 50-psig increments and inspect each joint between increments. Once the system test pressure is reached, add make-up water as necessary to maintain the system test pressure for 4 hours.
5. Test Phase: Reduce pressure by 10 psig and monitor pressure for 1 hour. During the test phase, do not increase pressure or add make-up water.
6. Pass/Fail Criteria: If no visual leakage is observed, and pressure during the 1-hour Test Phase remains steady (within 5% of the Test Phase pressure), a passing test is indicated.
7. If retesting is required, safely depressurize the test section by reducing pressure or releasing test liquid at a controlled rate. Allow the test section to “relax” for at least 8 hours before re-pressurizing. After the relaxation period, repeat the Initial Expansion and Test Phases in accordance with Sections 1 through 6.
8. Under no circumstances shall repairs or corrections be made to the test section until the line has been safely depressurized.
9. The total testing time (including the time required to pressurize, stabilize, hold test pressure, and depressurize the test section) shall not exceed 8 hours.
10. Perform service test of system components outside of the isolated test zone, such as transition fittings, valve connections, tapping sleeve and valve assemblies, etc., by monitoring connections under full system operating pressure, for a duration equivalent to testing of the isolated test zone. If leakage is observed, make necessary repairs or corrections and repeat test.

E. Prepare reports of testing activities in accordance with ASTM F2164, ASTM D2774, or AWWA C605.

F. General Guidelines for Safe Hydrostatic Testing of Piping:
   1. Pressure tests must always be performed by a competent person in strict accordance with an approved test procedure appropriate for the pipe specification.

2. All elements in the pipework and test equipment shall be checked to ensure appropriate pressure rating and pressure envelope integrity prior to the test. Test equipment must be calibrated.
3. Vents must be installed in the highpoint(s) and be used to remove entrapped air from the system before testing. Trapped air may cause an excessive pressure build that results in an uncontrolled energy release. Fire hydrants shall not be used as a replacement for highpoint air release vents.
4. Depending on the piping configuration, three calibrated gauges should be used; one at the high point, one at the low point to understand system head pressure (so as not to exceed material yield points), and one on the test pump. Ideally, one of the gauges should have the ability to record test pressures throughout the test.
5. “Whip checks" shall be installed on all hoses, including jumper lines.
6. All personnel must be removed from the test area and appropriate barricading with warning signs erected.
7. No unauthorized personnel shall enter the barricaded test area while the system is under pressure – body positioning must at all times be out of the line of fire.
8. For visual examination of leaks, the system should be reduced to design pressure or operating pressure.
9. If work inside the barricaded area is required, the system must be let down to atmospheric pressure before entering the test zone.

3.10 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in specification 143993-ASA-DD1-SPC-1411, Earth Moving.

3.11 CLEANING

A. Clean newly installed and impacted existing fire water distribution piping and appurtenances as follows:
   1. Flush new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use procedure described in NFPA 24 for flushing of fire piping. Flush piping system with clean, potable water or water from the plant dedicated fire water system until dirty water does not appear at points of outlet.
   3. Direct discharge water to a stable outfall on the project site.

B. Thoroughly flush newly constructed potable water system, and all parts of existing system affected by construction, with potable water to remove all sediment and debris

from the system. Following flushing, disinfect potable water system using the disinfecting procedure prescribed by AHJ or, if method is not prescribed by AHJ, use procedure described in AWWA C651 or as follows:

1. Fill newly constructed system and all parts of existing system affected by construction with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
2. Drain system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
3. Flush with clean, potable water until no chlorine remains in water coming from system.
4. Direct discharge water to a stable outfall on the project site.

C. Prepare reports of flushing and disinfecting activities.

END OF SECTION 1410

CONSTRUCTION SPECIFICATIONS

wood.
DOING BUSINESS AS WOOD GROUP USA, INC.

TITLE: Earth Moving	**143993-ASA-DD1-SPC-1411**
PROJECT: D.B. Wilson FGD Replacement	REV: 1
LOCATION: Centertown, KY	PROJECT NO. 245891

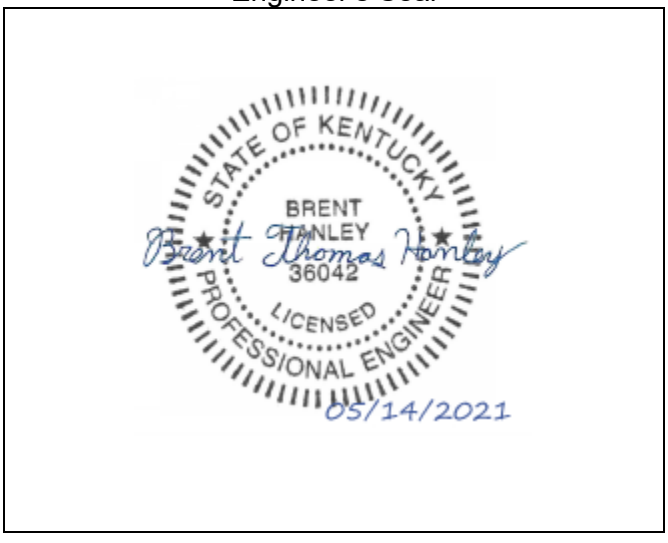
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	-

APPROVAL STATUS							
PREPARED BY:	LJN	DATE	15FEB21	APPROVED BY:	BTH	DATE	05MAR21
CHECKED BY:		DATE		APPROVED BY:	NDH	DATE	05MAR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	KAV		BTH	NDH	05MAR21
B	BID	KAV	BTH	BTH	NDH	01APR21
0	CONSTRUCTION	KAV	JTW	SJS	NDH	07MAY21
1	CONSTRUCTION (REMOVE HOLDS)	KAV	BTH	SJS	NDH	14MAY21

Engineer's Seal



SECTION 1411 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Site Grading
2. Preparing subgrades for slabs-on-grade and pavements.
3. Excavating and backfilling for buildings and structures.
4. Graded Aggregate Base Course for asphalt.
5. Excavating and backfilling trenches for utilities.
6. Construction dewatering.

B. Related Requirements:

R1

1. 143993-ASA-DD2-SPC-1302 – Cast-in-Place Concrete
2. 143993-ASA-DD1-SPC-1410 – Facility Water Distribution Piping
3. 143993-ASA-DD1-SPC-1416 – Facility Sanitary Sewer
4. 143993-ASA-DD1-SPC-1415 – Stormwater Conveyance
5. Geotechnical Report titled Report of Geotechnical Engineering Study Proposed Addition to D.B. Wilson Station, by Wood E&IS, Inc., dated November 30, 2020.
6. American Society for Testing and Materials (ASTM) Standards, latest revision.
7. American Association of State Highway and Transportation Officials (AASHTO) Standards, latest revision.
8. Occupational Safety and Health Administration (OSHA) Standards, latest revision.
9. Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridges, latest edition.

1.3 DEFINITIONS

A. Engineer:

Wood.
(Doing business as Wood Group USA, Inc.)
30 Patewood Dr., Suite 200
Greenville, SC 29615

B. Geotechnical:

Wood Environment & Infrastructure Solutions, Inc.
3800 Ezell Road, Suite 100
Nashville, TN 37211

C. Owner:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328

D. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a utility trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over Initial Backfill to fill a utility trench.

E. Base Course: Aggregate layer placed between the prepared and approved subgrade and hot-mix asphalt paving.

F. Bedding Course: Aggregate layer placed over the excavated and approved subgrade in a trench before laying pipe.

G. Borrow Soil: Satisfactory soil imported from off-site for use as Engineered Fill.

H. Engineered Fill: Soil materials used to raise existing grades in structural areas, as approved by the Geotechnical Engineer.

I. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below Base Course, bedding, topsoil materials, or geotextiles where specified.

L. Utilities: On-site underground pipes, conduits, ducts, cables, and associated structures, as well as underground services within buildings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Engineered Fill
2. Base Course
3. Bedding Course

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for Engineered Fill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698 for Engineered Fill and D1557 for Aggregate Base Course.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

D. Base Course shall be from a KYTC approved source.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify Kentucky 811 for the project area two (2) full days prior to starting earth moving operations.

C. Do not commence site clearing and earth moving operations until erosion and sedimentation control measures are in place.

D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil material from excavations or borrow soil for use as Engineered Fill, free of debris, waste, frozen materials, vegetation, and other deleterious matter as approved by Geotechnical Engineer.

C. Base Course: Consists of crushed aggregate base course, plant mixed as specified by KYTC for the respective pavement section. See section 302 and 805 of KYTC Standard Specifications for Road and Bridges, latest edition.

D. Engineered Fill: Engineered Fill shall consist of clean (free of organics and debris) non-plastic soils with maximum dry density as determined by the Standard Proctor compaction test (ASTM D698) and approved by the Geotechnical Engineer. Maximum Grain Size should not exceed 4 inches. Soils should generally classify as GW, SW, SP or SM in accordance with the USCS as approved by the Geotechnical Engineer.

E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Sand: ASTM C33; fine aggregate.

2.2 GEOTEXTILES

A. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2; AASHTO M 288.
2. Survivability: As follows:

    a. Grab Tensile Strength: 247 lbf; ASTM D4632.
    b. Sewn Seam Strength: 222 lbf; ASTM D1683.
    c. Tear Strength: 90 lbf; ASTM D4533.
    d. Puncture Strength: 90 lbf; ASTM D4833.

3. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
4. Permittivity: 0.02 per second, minimum; ASTM D4491.
5. UV Stability: 50 percent after 500 hours exposure; ASTM D4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by site clearing, earth moving or dewatering operations.

B. Protect and maintain benchmarks and survey control points from disturbance during clearing and earth-moving operations.

C. Protect and maintain erosion and sedimentation controls during clearing and earth moving operations.

D. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered.

1. If excavated materials intended for Engineered Fill include unsatisfactory soil materials and rock, replace with Satisfactory Soil materials.
2. Any excess Satisfactory Soil, unsatisfactory soil, excavated rock, landfill waste, or any other construction generated waste from earthwork operations shall be disposed of at an Owner and Authorities Having Jurisdiction (AHJ) approved off-site location.
3. The uppermost fine-grained soils shall not be used as Engineered Fill, and these soils shall be left exposed for the least possible amount of time during construction operations and remediated as directed by the Geotechnical Engineer in areas to receive proposed structures and pavements.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been placed, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Drainage, Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated. Do not disturb bottom of excavations intended as bearing surfaces.

B. Over-excavate and replace any localized zones of excessively wet, unstable, organic, yielding, or low bearing capacity materials as determined by the Geotechnical Engineer. Restore bottom of excavation to proper elevation with compacted Engineered Fill in areas over-excavated.

3.5 EXCAVATION FOR PAVEMENTS

A. Excavate surfaces under walks, pavements, and areas to receive aggregate surfacing to indicated lines, cross sections, elevations, and subgrades.

1. Extend soil removal to a minimum of 5 feet laterally beyond edge of pavement, walk, and aggregate surfacing except where indicated.

B. Over-excavate and replace any localized zones of excessively wet, unstable, organic, yielding, or low bearing capacity materials as determined by the Geotechnical Engineer. Restore bottom of excavation to proper elevation with compacted Engineered Fill in areas over-excavated.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

1. Excavate trench to a width which will permit satisfactory jointing of pipe and thorough tamping of bedding and backfill.
2. Maintain the following trench widths for single pipe installation:
   a. Minimum trench widths below a plane 12 inches above top of pipe shall be the greater of:
      1) The pipe outside diameter plus 16 inches; and
      2) The pipe outside diameter times 1.25, plus 12 inches.
   b. Maximum trench widths below a plane 12 inches above top of pipe shall be as follows:
      1) For pipes less than or equal to 24”, the pipe outside diameter + 2 feet; and
      2) For pipes 25” – 60”, the pipe outside diameter + 4 feet.
3. Above plane defined in 3.6.B.2, no maximum limit.
4. Maximum trench width limitations shall apply in areas more than 3 feet from catch basin or structure walls. Where within 3 feet from catch basin or structure walls, maximum width shall be as near the minimum specified as can be controlled by construction equipment and methods used.

C. Trench Bottoms: Excavate trenches 6 inches deeper than bottom of pipe and conduit elevations to allow for Bedding Course, except as otherwise indicated. Hand-excavate deeper for bells of pipe.

1. Where unstable or unsuitable soil conditions are encountered, over-excavate trenches as recommended by the Geotechnical Engineer. Restore bottom of trench to proper elevation with compacted Engineered Fill in areas over-excavated.

3.7 EXCAVATION SAFETY

A. Excavations shall be adequate for construction and inspection of all work under the contract. All excavation work shall be maintained and protected against earth collapse from natural causes or subsequent construction work and shall be in accordance with OSHA requirements and local regulatory requirements. Water shall be controlled in accordance with Section 3.2.

3.8 SUBGRADE PREPARATION AND INSPECTION

A. Notify Geotechnical Engineer when excavations have reached required subgrade.

B. All subgrades shall be compacted to a minimum of 98 percent of Standard Proctor maximum dry density per ASTM D698. Follow testing frequency requirements defined in Section 3.17.

C. If Geotechnical Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

D. Prepare subgrades in areas to support foundations, floor slabs, Engineered Fill, asphalt pavement, crushed aggregate pavement, and crushed aggregate surfacing as follows:

1. Perform proof-roll testing of subgrade materials by making four passes (with two of the passes being in a direction perpendicular to the preceding ones) with a fully loaded dump truck with a minimum gross weight of 20 tons in the presence of the Geotechnical Engineer. Do not proof-roll wet or saturated subgrades.
2. Limit vehicle speed to 3 mph for proof-rolling.
3. Identify soft areas to be undercut. Undercut zones shall extend 5 feet beyond the limit of the identified soft zones.
4. Excavate 1-foot horizontally (on all sides) for every 2-feet of undercut depth.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile Borrow Soil materials and excavated Satisfactory Soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover, install perimeter silt fence, or provide other approved methods to prevent windblown dust and erosion as detailed in the SWPPP.

1. Do not place material stockpiles, equipment, surcharges etc., within 15 feet of the crest of any excavated slope.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

C. Where shallow perched water or saturated soils are encountered during required excavation, the initial lifts of fill shall consist of clean sand with less than 12 percent of the soil particles by weight passing the No. 200 mesh sieve. This material should be placed to at least 2 feet about the perched water or saturated soil level or as needed to bridge over saturated in-situ soils.

1. Samples of fill material shall be submitted to the Geotechnical Engineer prior to backfill for approval.

D. Place backfill by spreading Engineered Fill, as specified, in maximum 8-inch-thick loose lifts, except where otherwise indicated.

E. Slopes shall be no steeper than 3:1 (horizontal: vertical).

F. Place Engineered Fill materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

G. Compact backfill, aggregate pavement, and utility trench Initial and Final Backfills to at least 98 percent of the Standard Proctor (ASTM D698) maximum dry density within structural areas and non-structural areas, except where otherwise indicated.

H. Compact aggregate base course beneath asphalt pavement to 100 percent of the Modified Proctor maximum dry density (ASTM D1557).

3.11 UTILITY TRENCH BACKFILL

A. Place Bedding Course on prepared subgrades approved by the Geotechnical Engineer and free of mud, frost, snow, or ice.

B. Place and compact Bedding Course on trench bottoms to a minimum of 98 percent of Standard Proctor maximum dry density per ASTM D698. Shape Bedding Course to provide continuous support for bells, joints, and barrels of pipes and for fittings and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings to within 18 inches of bottom of footings with Engineered Fill; fill with concrete to elevation of bottom of footings. For concrete, see Specification 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

D. Backfill voids while removing shoring and bracing.

E. Initial Backfill:

1. For HDPE pipe, place and compact Initial Backfill to a height of 6 inches over pipe or conduit. Initial Backfill shall be placed in maximum 8-inch lifts (loose measure). Coordinate backfilling with utilities testing.

F. Final Backfill:

1. Place and compact Final Backfill to final subgrade elevation. Coordinate backfilling with utilities testing.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 3 horizontal so fill material will bond with existing material.

B. Place and compact Engineered Fill material in layers to required elevations as follows:

1. Under grass areas.
2. Under pavements.
3. Under laydown areas and areas subject to construction traffic.
4. Under steps and ramps.
5. Under building slabs.
6. Under footings and foundations.

C. Place soil fill on prepared subgrades approved by the Geotechnical Engineer and free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent Engineered Fill layer before compaction to within 3 percent of optimum moisture content as determined by ASTM D698 (Standard Proctor) except as otherwise indicated.
   1. Do not place Engineered Fill on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air dry, otherwise Satisfactory Soil material that exceeds optimum moisture content by 3 percent (except as otherwise indicated) and is too wet to compact to specified dry density.
   3. Each day, the surface of the compacted fill shall be shaped to drain and sealed with a smooth roller to prevent accumulation of standing water and absorption of excess moisture.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:
   1. Under structures, building slabs, and steps, scarify and recompact the upper 24 inches of fill soil material compacted to at least 98 percent.
   2. Under flexible, rigid, and aggregate pavements, scarify and recompact each layer of backfill or fill soil material at 98 percent with the final lift of fill soil material compacted to at least 100 percent.

3. For utility trenches, compact each layer of Initial and Final Backfill soil material at 98 percent.
4. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil materials to 98 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water to defined outfalls. Slope grades to direct water away from buildings and excavations, and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Grassed or Unpaved Areas: Plus or minus 1 inch.
2. Asphalt and Aggregate Pavements and Walks: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch.

3.16 BASE COURSE PREPARATION AND INSPECTION UNDER PAVEMENTS AND WALKS

A. Place Base Course on subgrades free of mud, frost, snow, or ice.

B. Base Course layer under hot mix asphalt shall be installed per section 302 of KYTC Standard Specifications for Road and Bridges, latest edition.

C. Base Course inspection refer to section 302 of KYTC Standard Specifications for Road and Bridges, latest edition.

D. On prepared and approved subgrade, place Base Course under pavements and walks as follows:

1. Install separation geotextile on prepared and approved subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place Base Course over separation geotextile.
3. Shape Base Course to required crown elevations and cross-slope grades.

4. Place Base Course in layers of equal thickness, with no compacted layer more than 8 inches thick or less than 4 inches thick.
5. Compact Base Course to within 3 percent of optimum moisture content to required grades, lines, cross sections, thickness and 100% maximum modified proctor according to ASTM D1557.

3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified Geotechnical Engineer to perform required tests and inspections.

B. Allow testing agency to inspect and test subgrades, aggregate pavements/surfacing, utility trench bedding and Initial/Final Backfills, and Engineered Fills. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Geotechnical Engineer.

D. Utility Excavation Bedding and Backfills: Perform at least one in-place moisture content and one density test per lift for every 100 linear foot of fill (including bedding) placed in utility trenches or areas surrounding utility structures. As a minimum, one in-place moisture content and one density test shall be performed on every lift (including bedding).

E. Soil Density Testing Frequency for Foundations: Perform one in-place moisture content and one density test for every 2,500 square feet per lift. As a minimum, one in-place moisture content and one density test shall be performed on every lift of fill, with a minimum of four density test per building.

F. Soil Density Testing Frequency for Pavement: Perform one in-place moisture content and one density test for every 10,000 square feet per lift. As a minimum, one in-place moisture content and one density test shall be performed on every lift of fill.

G. Soil Density Testing for Crushed Aggregate/Surfacing: Perform one in-place moisture content and one density test for every 10,000 square feet per lift. As a minimum, one in-place moisture content and one density test shall be performed on every lift of fill.

H. Soil Density Testing Frequency for Non-Structural Areas: Perform one in-place moisture content and one density test for every 5,000 square feet per lift. As a minimum, one in-place moisture content and one density test shall be performed on every lift of fill.

I. When testing agency reports that subgrades, aggregate pavements/surfacing, utility trench bedding, Initial/Final Backfills, or Engineered Fills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; re-compact and retest until specified compaction is obtained.

3.18 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic except indicated construction phase traffic routes. Protect areas from freezing, saturation, and erosion as applicable. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Geotechnical Engineer; reshape and re-compact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus Satisfactory Soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Geotechnical Engineer and Owner.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose them off Owner’s property.

END OF SECTION 1411

CONSTRUCTION SPECIFICATIONS

wood.
DOING BUSINESS AS WOOD GROUP USA, INC.

TITLE: Asphalt Paving	**143993-ASA-DD1-SPC-1412**
PROJECT: D.B. Wilson FGD Replacement	REV: 0
LOCATION: Centertown, KY	PROJECT NO. 245891

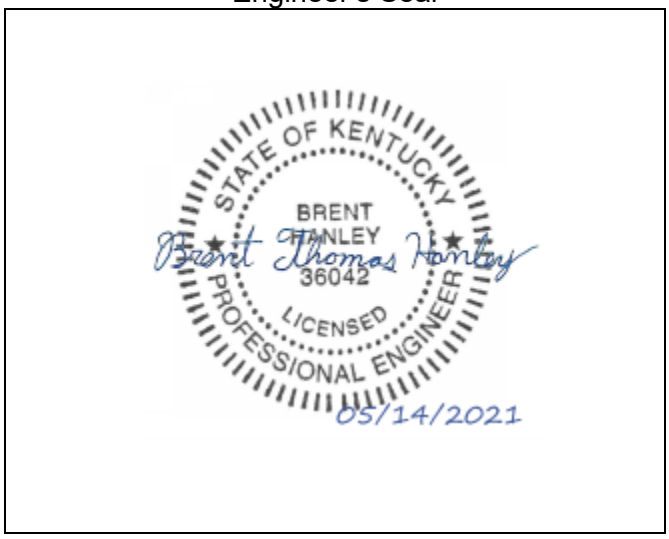
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	-

APPROVAL STATUS							
PREPARED BY:	KAV	DATE	15FEB21	APPROVED BY:	BTH	DATE	05MAR21
CHECKED BY:	BTH	DATE	13MAY21	APPROVED BY:	NDH	DATE	05MAR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	KAV		BTH	NDH	05MAR21
0	CONSTRUCTION	KAV	BTH	SJS	NDH	14MAY21

Engineer's Seal



SECTION 1412 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt paving.

B. Related Requirements:
   1. 143993-ASA-DD1-SPC-1411 Earth Moving for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
   2. Asphalt Institute (AI) Standards, latest revision
   3. American Association of State Highway and Transportation Officials (AASHTO) Standards, latest revision
   4. American Society for Testing and Materials (ASTM) Standards, latest revision
   5. Kentucky Transportation Cabinet (KYTC) Standard Specifications for Road and Bridges, latest edition.

1.3 DEFINITIONS

A. Engineer:

Wood.
(Doing business as Wood Group USA, Inc.)
30 Patewood Dr., Suite 200
Greenville, SC 29615

B. Owner:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.
   2. Job-Mix Designs: For each job mix proposed for the work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and testing agency.

B. Material Certificates: For each paving material. Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

C. Material Test Reports: For each paving material, by a qualified testing agency.

D. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the KYTC.

B. Testing Agency Qualifications: Qualified according to ASTM D3666 for testing indicated.

C. Other Requirements: Comply with materials, workmanship, and other applicable requirements of the KYTC for asphalt paving work.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Prime Coat: Minimum ambient air temperature of 35 deg F.

2. Tack Coat: Minimum ambient air temperature of 40 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course: Minimum ambient air temperature of 35 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum ambient air temperature of 45 deg F at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692 sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag; and conforming to KYTC sections 804.

C. Fine Aggregate: ASTM D1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof; and conforming to KYTC sections 805.
   1. For hot-mix asphalt, limit natural sand to a maximum of 10 percent by weight of the total aggregate mass.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 binder designation PG 58-28, PG 64-22, or PG 76-22.

B. Cutback Prime Coat: ASTM D2027, medium-curing cutback asphalt, SS-1h.

C. Emulsified Asphalt Prime Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

D. Tack Coat: AASHTO M 140 emulsified asphalt, or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where project is located.
   2. Materials shall meet the requirements of Sections 2.1 and 2.2.
   3. Standard Duty Base Course: Per KYTC Appendix D, base course for standard duty sections shall conform to mix design CL2 ASPH BASE 1.00D PG64-22 (00212) or approved equivalent.
   4. Standard Duty Surface Course: Per KYTC Appendix D, surface course for standard duty sections shall conform to mix design CL2 ASPH SURF 0.38D PG64-22 (00301) or approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the work.

B. Prepare subgrade in accordance with specification 143993-ASA-DD1-SPC-1411, Earth Moving.

3.3 PLACING HOT-MIX ASPHALT

A. Hot-mix asphalt shall conform to KYTC section 402.

B. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

C. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course before placing asphalt surface course.

D. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either bulkhead or papered method according to AI MS-22, for both ending a lane and resumption of paving operations.
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D2041, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
   1. Base Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner shall engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to ASTM D3549.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to ASTM D979.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared according to ASTM D2041, and compacted according to job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples according to ASTM D1188 or ASTM D2726.

      a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method according to ASTM D2950 and correlated with ASTM D1188 or ASTM D2726.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.8 WASTE HANDLING

A. General: Handle asphalt-paving waste according to specification 143993-ASA-DD1-SPC-1411, Earth Moving.

END OF SECTION 1412

CONSTRUCTION SPECIFICATIONS

DOING BUSINESS AS WOOD GROUP USA, INC.

TITLE: Stormwater Conveyance	**143993-ASA-DD1-SPC-1415**
PROJECT: D.B. Wilson FGD Replacement	REV: 1
LOCATION: Centertown, KY	PROJECT NO. 245891

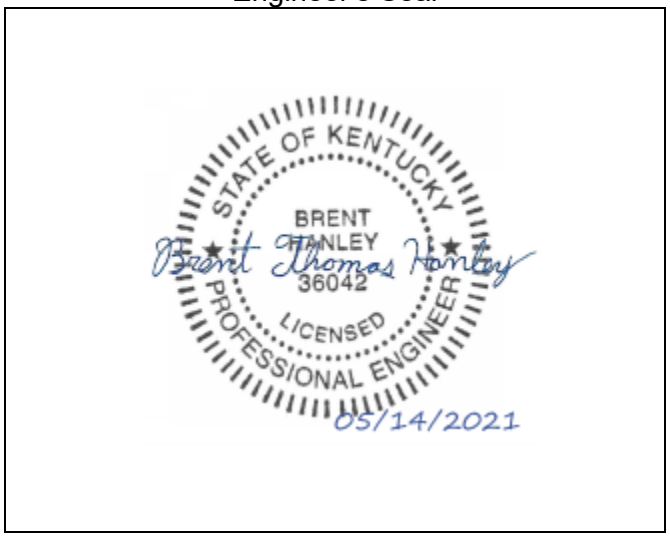
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	-

APPROVAL STATUS							
PREPARED BY:	KAV	DATE	15FEB21	APPROVED BY:	BTH	DATE	05MAR21
CHECKED BY:	BTH	DATE	13MAY21	APPROVED BY:	NDH	DATE	05MAR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	KAV		BTH	NDH	05MAR21
B	BID	KAV	BTH	SJS	NDH	01APR21
0	CONSTRUCTION	KAV	JTW	SJS	NDH	07MAY21
1	CONSTRUCTION (REMOVE HOLDS)	KAV	BTH	SJS	NDH	14MAY21

Engineer's Seal



SECTION 1415 – STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe and fittings.
   2. Catch basins.

B. Related Requirements:
   1. 143993-ASA-DD1-SPC-1411, Earth Moving
   2. 143993-ASA-DD1-SPC-1410, Facility Water Distribution Piping
   3. 143993-ASA-DD1-SPC-1416, Facility Sanitary Sewer
   4. 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete
   5. American Society for Testing and Materials (ASTM) Standards, latest revision
   6. American Concrete Pipe Association (ACPA) Standards, latest revision
   7. American Association of State Highway and Transportation Officials (AASHTO) Standards, latest revision

R1

1.3 DEFINITIONS

A. Engineer:

Wood.
(Doing business as Wood Group USA, Inc.)
30 Patewood Dr., Suite 200
Greenville, SC 29615

B. Owner:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:
1. Catch Basins – Include plans, elevations, sections, details, frames, and grates;
2. Pipe and Fittings;
3. Pipe-to-Catch Basin Connections.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Show pipe sizes, locations, and elevations. Indicate interface and spatial relationship between catch basins, piping, and proximate structures.

B. Product Certificates: For each type of pipe and fitting, from manufacturer.

C. Field quality-control reports.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle catch basins in accordance with manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 POLYETHYLENE (PE) PIPE AND FITTINGS

A. High Density Polyethylene (HDPE) Pipe NPS 4 to NPS 10: AASHTO M252, Type S watertight according to the requirements of ASTM D3212. Pipe joints shall have watertight gaskets in accordance with ASTM F477. Fittings shall be watertight and conform to AASHTO M252.

B. All HDPE pipe shall be made from virgin material. HDPE pipe and fittings shall not be made from reprocessed material.

2.2 CATCH BASINS

A. Standard Precast Concrete Catch Basins:
1. Description: ASTM C478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: As indicated on drawings.
3. Base Section: 8-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
4. Riser Sections: As needed for manhole depths indicated on drawings.
5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings. Flat-slab-top in areas of limited elevation.
6. Joint Sealant: ASTM C443, bitumen or butyl rubber.
7. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
8. Grade Rings: Reinforced-concrete rings, of 6- to 9-inch total thickness, to match diameter of manhole frame and cover, and height as required to adjust frame and cover/grate to indicated elevation and slope.
9. Sump: 12” sump depth. Sump depth measured from invert of outlet pipe to floor of manhole.
10. Steps: Steps shall not be installed in catch basins.
11. Pipe Connectors: ASTM C923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Covers:
1. As specified on the drawings
2. Load rating shall be HS-20.

2.3 CONCRETE

1. General: Cast-in-place concrete according to 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in specification 143993-ASA-DD1-SPC-1411, Earth Moving.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install catch basins for changes in direction as indicated in Section 3.4 unless fittings are indicated.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of microtunneling or horizontal directional drilling as approved by Owner or Engineer.

E. Install gravity-flow, non-pressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow.
   2. Install piping with 24-in minimum cover.
   3. Install PE piping according to ASTM D2321.
   4. Any unknown underground utilities encountered during piping installation shall be reviewed for impacts with the Engineer prior to proceeding with construction.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:
   1. Join PE piping according to ASTM D3212 for push-on joints.

3.4 CATCH BASIN INSTALLATION

A. General: Install catch basins, complete with appurtenances and accessories indicated.

B. Install precast concrete catch basin sections according to ASTM C478, Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.

C. Where specific catch basin construction is not indicated, follow manufacturer's written instructions.

D. Set catch basin frames and grates to elevations as indicated on drawings.

3.5 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

3.6 IDENTIFICATION

A. Materials and their installation are specified in 143993-ASA-DD1-SPC-1411, Earth Moving. Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.

1. Use detectable warning tape over all piping and over edges of underground structures.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place and again at completion of project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials and repeat inspections until defects are removed.
   4. Reinspect and repeat procedure until results are satisfactory.

B. Following completion of inspections and any required repairs per section 3.7.A, test new piping systems including catch basin and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not put into service before successful completion of testing outlined in this section.

2. Test completed piping systems in accordance with requirements listed below or as otherwise required by authorities having jurisdiction.
3. Schedule tests with Engineer and authorities having jurisdiction with at least 24 hours advance notice.
4. Submit separate report for each test, including any required corrective actions.
5. Test storm drainage systems according to the following:
    a. Hydrostatic tests shall be conducted by applying pressure to the test section through a static water column in an open standpipe or storm water structure. Minimum water column height shall be 10'. Other test methods shall be reviewed and approved by the Engineer.
    b. Contractor shall coordinate with Engineer on required test pressure/elevation for each test section.
    c. Install temporary plug at downstream end of test section. Temporary plug shall have a minimum pressure rating greater than the system test pressure.
    d. Contractor shall make appropriate provisions to restrict access to test section and maintain safe work conditions during the testing procedure.
    e. Use only clear water for filling of the test section. Fill the test section slowly to test elevation. Purge all air. Take all appropriate precautions to ensure that no air is trapped in the test section.
    f. Maintain test pressure/elevation for at least 15 minutes.
    g. No visible leakage over 15-minute test period shall indicate a passing test.
    h. If leakage is observed, safely drain test section to a suitable stabilized outfall approved by engineer, make necessary repairs or corrections using new materials, and repeat test.
    i. Upon successful test completion, safely drain test section to a suitable stabilized outfall approved by engineer prior to removal of the temporary plug.
6. Underdrain piping system shall be excluded from testing requirements.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, repair leaking structures and other system components as applicable, and repeat testing until a passing test is achieved.

3.8 CLEANING

A. Clean interior of piping, structures, and other system components as applicable of dirt and superfluous materials. Flush with water.

END OF SECTION 1415

CONSTRUCTION SPECIFICATIONS

wood.
DOING BUSINESS AS WOOD GROUP USA, INC.

TITLE: Facility Sanitary Sewer	**143993-ASA-DD1-SPC-1416**
PROJECT: D.B. Wilson FGD Replacement	REV: 0
LOCATION: Centertown, KY	PROJECT NO. 245891

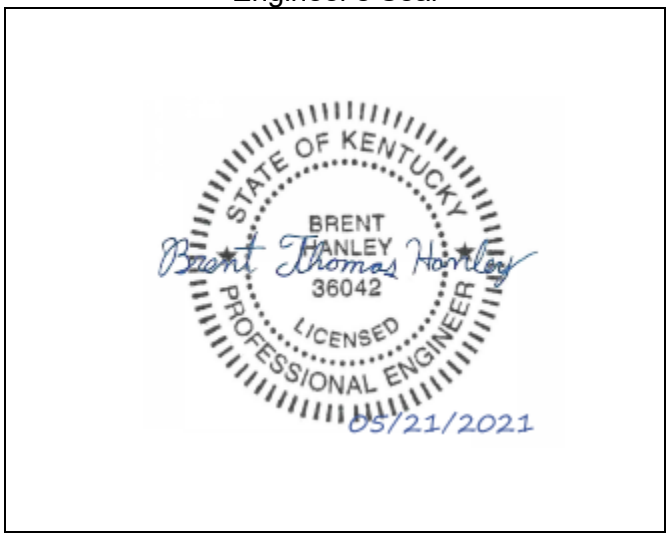
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	-

APPROVAL STATUS							
PREPARED BY:	KAV	DATE	10MAY21	APPROVED BY:	BTH	DATE	14MAY21
CHECKED BY:	BTH	DATE	21MAY21	APPROVED BY:	NDH	DATE	14MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	KAV	BTH	SJS	NDH	14MAY21
0	CONSTRUCTION	KAV	BTH	SJS	NDH	21MAY21

Engineer's Seal



TITLE: Facility Sanitary Sewer	**143993-ASA-DD1-SPC-1416**
PROJECT: D.B. Wilson FGD Replacement	REV: 0
LOCATION: Centertown, KY	PROJECT NO. 245891

SECTION 1416 - FACILITY SANITARY SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY

A. This section includes piping and related components for the sanitary sewer system.

B. Related Requirements:
1. 143993-ASA-DD1-SPC-1410 – Facility Water Distribution Piping
2. 143993-ASA-DD1-SPC-1411 – Earth Moving
3. 143993-ASA-DD2-SPC-1302 – Cast-in-Place Concrete
4. American Society for Testing and Materials (ASTM) Standards, latest revision
5. American Water Works Association (AWWA) Standards, latest revision

1.3 DEFINITIONS

A. Engineer:

Wood.
(Doing business as Wood Group USA, Inc.)
30 Patewood Dr., Suite 200
Greenville, SC 29615

B. Owner:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328

C. AHJ: Authority having jurisdiction.

D. HDPE: High Density Polyethylene.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, couplings, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, couplings, cleanouts, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.8 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
   1. Notify Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of service without Owner's written permission.
   3. Coordinate with Owner on pump-down and lock-out/tag-out procedures for all work affecting existing sanitary lift stations.

PART 2 - PRODUCTS

2.1 HDPE PIPE AND FITTINGS

A. HDPE Piping:

1. Pipe: PE 4710 high density polyethylene meeting cell classification 445574C for black or 445574E for stripes per ASTM D3350, and shall be listed in the name of the pipe and fitting manufacturer in Plastics Pipe Institute (PPI) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade Hydrostatic Design Basis (HDB) rating of 1600 psi at 73°F. The manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.
2. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D3261 and shall be so marked.
3. Custom Fabricated Fittings: With approval of Engineer, custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe.
4. All piping and fittings shall be rated for a minimum working pressure of 150 psig.

2.2 MANHOLES TIE-IN FITTINGS

A. Resilient Pipe Connectors: ASTM C923, cast or fitted into manhole walls, for each pipe connection.

B. Stainless Steel Stiffeners: ASTM 240 type 304, insert reinforcement, for each pipe connection.

2.3 CONCRETE

A. Concrete shall be in accordance with specification 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to specification 143993-ASA-DD1-SPC-1411, Earth Moving for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Install piping as

indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install fittings for changes in direction as indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. When installing pipe under streets or other obstructions that cannot be disturbed, use directional drilling.

F. Install force-main, pressure piping according to the following:
1. Install piping at a continuous grade to the degree feasible, minimizing intermediate high points along the force main alignment.
2. Install piping with 36-inch minimum cover unless otherwise indicated on the design drawings.
3. Install HDPE according to ASTM D2774 and ASTM F645.
4. Any unknown undergrounds encountered during piping installation shall be reviewed for impacts with the Civil Engineer.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 JOINT CONSTRUCTION

A. Heat Fusion Joining:
1. All joining of HDPE pipe and fittings shall be per ASTM F2620 and as recommended by the manufacturer.
2. Heat fusion joining and other procedures necessary for correct assembly of HDPE pipe and fittings shall be done by manufacturer-trained personnel using tools approved by the pipe manufacturer.
3. Joint strength must be equal to that of adjacent pipe.
4. External appearance of fusion bead shall be smooth with bead width in accordance with pipe manufacturer's recommendations.

5. A trial fusion shall be made each day to check required heating times for prevailing ambient temperatures and other weather conditions.
6. A pipe cutter shall be used for squaring pipe ends or a facing tool for joining.
7. Remove the sharp outer edge on the outside diameter surface on all pipe sizes for socket fusion joint.
8. Remove any burrs from inside of pipe ends. Both ends of pipe to be joined shall be clean, dry, and free of foreign substance.
9. Fusion machine shall be the type used for fusing pipe ends together.
10. The machine shall be equipped with a powered facing unit to prepare pipe ends.
11. Heating plate shall be electrically heated and thermostatically controlled having a temperature gauge to monitor temperature.
12. If pipe is to be joined prior to placing in pipe trench, the maximum length of pre-joined pipe shall be no more than 200 feet in length.
13. Direct burial: The temperature of the pipe shall be approximately the same as the soil at the installed depth before completing the tie-in.
14. At joints connected to piping systems or fittings of other materials by a flange assembly, the pipe adjacent to these joints shall be supported on either side of the flange assembly:
    a. For a distance of one pipe diameter, or
    b. Not more than 12 inches from joint, or
    c. Whichever is greater.
15. HDPE joints between plain end pipes and fittings shall be made by butt fusion or with electrofusion fittings, using only procedures that are recommended by the manufacturer.
16. The procedures and procedure qualification records must be reviewed by the inspector representing the Contractor before any heat fusion joining begins.
17. External and internal beads shall not be removed.

B. Heat Fusion Training:
1. Contractor shall ensure that persons making heat fusion joints have received training in the manufacturer's recommended procedure.
2. Contractor shall maintain records of trained personnel and shall certify that training was received not more than 12 months before commencing construction.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318-14 and 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

3.5 CONNECTIONS

A. Make connections to underground manholes.

1. Make branch connections into existing underground manholes and lift station wet wells by cutting openings into existing structures large enough to accommodate resilient pipe connectors. Cut end of connection pipe passing through structure wall to conform to shape of, and be flush with, inside wall unless otherwise indicated. On outside manhole wall, encase entering connection in 6 inches of concrete for minimum length of 12 inches to provide additional support of collar from connection to undisturbed ground.

    a. Concrete installation shall be in accordance with specification 143993-ASA-DD2-SPC-1302, Cast-in-Place Concrete.

2. Protect existing piping, manholes, and lift station wet wells to prevent concrete and/or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.6 IDENTIFICATION

A. Comply with requirements in 143993-ASA-DD1-SPC-1411, Earth Moving for underground utility identification devices. Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

B. Use detectable warning tape over piping.

3.7 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of project.
1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.

e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

C. Hydrostatic Tests: Test sanitary force mains, and other sanitary piping in special cases where minimum separation distances are not met per the requirements indicated on the drawings, according to the following:
1. The testing in this section shall be limited to newly installed piping and appurtenances per this specification. Any additional testing, including testing of any existing system components included in the test sections, shall require coordination with the Engineer. All temporary and permanent pipe connections, fittings, or any other apparatus used during testing, shall be rated for a minimum pressure equivalent to the system test pressure. Install temporary blind flanges on air release vents during pressure test.
2. Follow all safety requirements as defined in ASTM F2164, as applicable.
3. The pressure at the lowest element in the system shall be 150 psig. The pressure shall be maintained for 2 hours. During the test, leakage from the test section shall be measured. The maximum allowable leakage shall be 1/4 gallon per inch diameter per 1000 feet of pipe per hour.
4. If leakage exceeds the criteria in Section C.3, safely depressurize the test section, make necessary repairs or corrections, and repeat test.
5. Under no circumstances shall repairs or corrections be made to the test section until the test section has been safely depressurized.

D. General Guidelines for Safe Hydrostatic Testing of Piping:

1. Pressure tests must always be performed by a competent person in strict accordance with an approved test procedure appropriate for the pipe specification.
2. All elements in the pipework and test equipment shall be checked to ensure appropriate pressure rating and pressure envelope integrity prior to the test. Test equipment must be calibrated.

3. Vents must be installed in the highpoint(s) and be used to remove entrapped air from the system before testing. Trapped air may cause an excessive pressure build that results in an uncontrolled energy release.
4. Depending on the piping configuration, three calibrated gauges should be used; one at the high point, one at the low point to understand system head pressure (so as not to exceed material yield points) and one on the test pump. Ideally, one of the gauges should have the ability to record test pressures throughout the test.
5. “Whip checks" shall be installed on all hoses, including jumper lines.
6. All personnel must be removed from the test area and appropriate barricading with warning signs erected.
7. No unauthorized personnel shall enter the barricaded test area while the system is under pressure – body positioning must at all times be out of the line of fire.
8. For visual examination of leaks, the system should be reduced to design pressure or operating pressure.
9. If work inside the barricaded area is required, the system must be let down to atmospheric pressure before entering the test zone.

E. Manholes: Perform vacuum test according to ASTM C1244.

1. Structures not meeting the passing criteria shall be repaired and retested.

3.8 CLEANING

A. Clean dirt and superfluous material from interior of piping and newly installed structures. Flush with potable water.

END OF SECTION 1416

Big Rivers ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix D – Rev 2

Structural Specifications

(No updates to any documents since Rev 0 Package)

Appendix	Document Number	Document Title	Document Revision
D	143993-ASA-DD2-SPC-1300	AUGER-GROUTED PILES - CONSTRUCTION SPECIFICATION	0
D	143993-ASA-DD2-SPC-1301	DRILLED PIERS - CONSTRUCTION SPECIFICATION	0
D	143993-ASA-DD2-SPC-1302	CAST-IN-PLACE CONCRETE - CONSTRUCTION SPECIFICATION	0
D	143993-ASA-DD2-SPC-1303	GROUT - CONSTRUCTION SPECIFICATION	0
D	143993-ASA-DD2-SPC-1304	STRUCTURAL STEEL FRAMING - CONSTRUCTION SPECIFICATION	0
D	143993-ASA-DD2-SPC-1305	SPECIAL INSPECTIONS AND TESTS - CONSTRUCTION SPECIFICATION	0

CONSTRUCTION SPECIFICATION

wood.

TITLE: **AUGER-GROUTED PILES**	PROJECT DOC. NO.: **143993-ASA-DD2-SPC-1300**	REV. **0**

PROJECT NAME:	**D.B. Wilson Station FGD Retrofit Project**	PROJECT NO.:	**245891**
CLIENT:	**Big River Electric Corporation**	AREA NO.:	

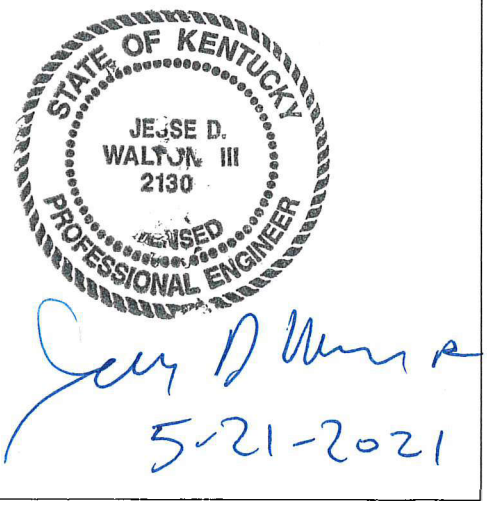
APPROVAL STATUS							
PREPARED BY:	DRF	**DATE**	10FEB21	**CHECKED BY:**	SCK	**DATE**	23FEB21
APPROVED BY:	JDW	**DATE**	12FEB21	**APPROVED BY:**	CLF	**DATE**	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 316316

AUGER-GROUTED PILES

1.0 GENERAL

1.1 SCOPE

1.1.1 This Specification includes the furnishing of all materials, labor, equipment, and supplies, and the performance of all operations necessary to install auger-grouted piles. The piles shall be the kind and quality specified herein and shall be placed as shown on the Drawings and installed as specified herein.

1.1.2 Site Conditions: The Contractor shall examine the areas and conditions under which piles are to be installed and notify the Owner's Representative in writing, two weeks before beginning pile installation, of conditions detrimental to the proper and timely completion of the work.

1.1.3 Existing Utilities: If utilities are to remain in place, provide protection from damage during operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Owner's Representative immediately for directions as to procedures. Cooperate with the Owner's Representative and the public or private utility companies, in keeping their respective service and facilities in operation. Repair damaged utilities by methods approved by the utility owner.

1.2 OTHER PROJECT SPECIFICATION SECTIONS REFERENCED HEREIN

- Special Inspections and Testing – SECTION 014533

1.3 PUBLICATIONS REFERENCED HEREIN (Latest edition unless noted)

- American Society for Testing and Materials (ASTM), Standards as indicated
- OSHA Regulations – 29 CFR Part 1910 Occupational Safety and Health Standards
- OSHA Regulations – 29 CFR Part 1926 Safety and Health Regulations for Construction
- 2015 International Building Code, Chapter 17 Special Inspections and Tests

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership or corporation responsible for providing the piling and all scope of work defined herein.

1.4.2 Owner. Big River Electric Corporation.

1.4.3 Owner's Representative. The authorized representative of the Owner.

1.4.4 Engineer. Wood, doing business as AMEC Foster Wheeler Industrial Power Company, Inc.

1.4.5 Geotechnical Engineer. An independent soils engineering consultant, engaged by the Owner, who shall determine installation criteria in consultation with the Engineer and shall perform inspection services as required. The Geotechnical Engineer shall be licensed in the State of Kentucky.

1.4.6 Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform testing services required in this section not otherwise designated, and to perform any such services requested by the Owner's Representative.

1.4.7 Auger Refusal. The point at which the auger, with approved cutting teeth, rotating under its full weight at the standard drilling speed, advances no more than two inches in one minute.

1.4.8 Production Piles. Piles installed after completion of pile load tests.

1.4.9 Special Inspections. Inspections required by the International Building Code, Chapter 17, for the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

1.5 SUBSURFACE SOIL INFORMATION

Reports of subsurface soil investigations pertaining to this project are available from the Owner upon request. The contents of these reports are offered only as general information. These reports were prepared only for the Owner's and Engineer's use in design and do not form a part of this contract. These reports are not a warranty of subsurface conditions. The reference report is "Report of Geotechnincal Engineering Study Addition to D., B. Wilson Station Big Rivers Electirc Corporation Centertown, Kentucky", Wood Environment & Infrastructure Solutions, Inc., 216 Centerview Drive, Suite 300 Brentwood, Tennessee 37027, Wood E&IS Project No. 7382-20-9000**,** dated 30 November 2020.

1.6 SUBMITTALS

1.6.1 *Certifications of Contractor's Capability.* The Contractor shall provide evidence that the Contractor has successfully completed three previous similar projects with approximately the same piling quantity under similar subsurface conditions.

1.6.2 *Description of Proposed Materials and Equipment.* The Contractor shall provide a written mix design report for the proposed grout (including pertinent physical properties of each ingredient used) and manufacturer's data on the equipment to be used.

1.6.3 *Description of Proposed Installation Procedure.* The Contractor shall provide a written explanation of the proposed procedures for the pile testing and pile installation.

1.6.4 *Daily Piling Reports.* The Contractor shall provide written reports which outline the amount and nature of work accomplished each day, including identifying each pile installed. These reports shall include pile locations, elevations of tip and level of cut off, the amount of grout used to complete each pile, and explanation of anything unusual relative to pile installation or operation of the equipment. These daily reports shall be submitted to the Engineer and the Geotechnical Engineer for review.

1.6.4.1 The piling report shall also include the following data:

- Amount of water added to the ready mix grout truck at the jobsite
- Flow cone results
- Time of starting auger removal
- Time of completion of auger removal
- Rate of auger withdrawal
- Ready Mix truck delivery ticket batch number
- Number of grout samples taken per pile

1.6.5 *Field Grout Test Reports.* Provide written reports of specified testing of representative grout test cubes or cylinders. All grout test cubes or cylinders shall have a unique numbering system, identifying them with the pile represented, and the Ready Mix truck delivery ticket batch number.

1.6.6 *Final Installation Report.* The Geotechnical Engineer shall provide a written summary of the piling installation. All deviations from the specifications and anything unusual relative to the pile installation shall be noted and the corrective action taken, described. This summary shall bear the Geotechnical Engineer's seal and signature.

1.6.7 *Special Inspections Reports.* All special inspections reports shall be prepared and submitted as described in Section 014533, Special Inspections and Tests, of the Construction Specifications.

1.7 INSTALLATION CRITERIA

Final pile bottom elevations and other pertinent installation criteria shall be determined by the Geotechnical Engineer after pile load tests have been completed. Production piles shall be installed in accordance with these criteria, as directed by the Geotechnical Engineer's Representative.

1.8 ALTERNATE PILE TYPE

An alternate pile type of equal capacity and having a proven performance record may be submitted for consideration, provided that the Contractor's submittal includes a complete material and installation specification which contains requirements corresponding to those included in this Section and descriptive material which documents the fact that the proposed piling will in all respects be capable of meeting the requirements of this Section. Alternate pile type submittals shall contain the following information: pile diameters, lengths, allowable compression, tension & lateral load capacities, minimum spacing requirements, group effect factors for lateral loads, vertical pile stiffness and lateral pile stiffness.

1.9 PRECONSTRUCTION CONFERENCE

A preconstruction conference shall be conducted at the job site prior to the installation of the first pile, between the Contractor, the Geotechnical Engineer, and the Owner's Representative, for a final review of the proposed materials, equipment, and procedure.

1.10 SAFETY

The Contractor and others engaged in performing the work for this specification shall perform their work in a safe manner in accordance with OSHA regulations and all safety requirements of the Owner.

2.0 PRODUCTS

2.1 GENERAL

2.1.1 All materials shall be new and all equipment shall be in good repair and capable of performing the work intended.

2.1.2 Auger-grouted piling shall be placed in accordance with this specification, unless the Contractor is given permission to place another type of piling as provided in Paragraph 1.8. The number of piles and locations shall be in accordance with the piling plan drawings regardless of pile type.

2.2 MATERIALS FOR AUGER-GROUTED PILING

2.2.1 Portland Cement shall conform to ASTM C150, Type II, all of the same brand.

2.2.2 Pozzolan material shall be a fly ash or other approved pozzolanic material conforming to ASTM C618.

2.2.3 Grout fluidifier shall conform to ASTM C937, except that expansion shall not exceed 4 percent. The fluidifier shall be a compound possessing characteristics which will increase the flowability of the mixture, assist in the dispersal of cement grains, and neutralize the setting shrinkage of the high-strength cement mortar.

2.2.4 Fine aggregate shall conform to ASTM C33 (Concrete Aggregates).

2.2.5 Admixtures used in the work shall be of the same composition as those used in the laboratory trial batch. Calcium chloride shall not be used.

2.2.6 Mixing water shall be suitable for drinking.

2.2.7 Grout used for the pile shafts shall consist of an approved mixture of Portland cement, a pozzolanic material when approved, fluidifier, fine aggregate and water, proportioned and mixed so as to provide a grout capable of maintaining the solids in suspension without appreciable water gain and so as to attain a minimum compressive strength of 4000 psi in 28 days, yet which may be placed without difficulty and which will laterally penetrate and fill any voids in the foundation material.

2.2.8 *Laboratory Strength Requirements.* A laboratory trial batch of any grout mix to be used for batching project concrete shall attain a minimum compressive strength of 250 psi in 4 hours, 500 psi in 8 hours, 2500 psi in 7 days and 4000 psi in 28 days.

2.3 REINFORCING STEEL

2.3.1 All reinforcing steel shall conform to ASTM A615 Grade 60, or as otherwise noted on the Drawings.

2.3.2 Dywidag Threadbar, as manufactured by Dywidag Systems International, (or approved equal) conforming to ASTM A722 Grade 150 as indicated on the Drawings. The Dywidag Threadbar is not to be installed as a post tension system. Only a single bar is to be provided and installed per tension pile as indicated on the Drawings. All necessary hardware shall

be provided to ensure that the Dywidag Threadbar is installed at the center of the pile to within 6 inches of the bottom of the pile.

2.4 AUGER-GROUTED PILING EQUIPMENT

2.4.1 Augering equipment shall be hollow-shafted with a minimum inside diameter of 1¼ inches and shall meet the following requirements:

- Shall be capable of imparting sufficient torque to the auger to produce piles of the specified capacity, subject to the approval of the Geotechnical Engineer.
- Auger flighting shall be continuous over the entire length with no gaps.
- Piling leads shall be equipped to prevent noticeable rotational or wobble movement.

2.4.2 *Mixing and Pumping Equipment.* The mixing equipment shall be of the continuous mixing and continuous agitating type. The grout pump, equipped with a grout pressure gauge, shall be a positive displacement piston-type pump capable of developing the required displacing pressures, and shall not contain oil or other rust inhibitor. Adequate means for insuring continuity in the pumping operation and for insuring the placing of grout homogeneously shall be provided. The Contractor shall document the total volume of grout placed in each pile.

3.0 EXECUTION

3.1 GENERAL

The Contractor shall furnish all piling materials, labor, tools, supervision, equipment, and supplies necessary for installing auger-grouted piles in accordance with the contract documents and this specification.

The Contractor shall comply with Federal Standards and Instructions of the Occupational Safety and Health Administration (OSHA), including any additional requirements by state or local agencies that have jurisdiction where piles are to be installed.

The installation of each pile shall not begin until each specified preliminary requirement is met. The Geotechnical Engineer's Representative shall be present during the complete installation of each pile.

3.2 LOCATION OF PILES

Test piles, as well as other piles required for load tests, shall be located as shown on the Drawings or as otherwise directed by the Owner's Representative.

The locations of the piles as shown on the Drawings shall be established by a surveyor registered in the State of Kentucky. The Surveyor shall be paid by the Contractor.

3.3 PLACEMENT TOLERANCES

3.3.1 Pile centers shall be located to an accuracy of plus or minus three inches.

3.3.2 Pile cutoffs shall be within one inch of elevations shown on the Drawings.

3.3.3 Vertical piles shall be plumb within two percent.

3.3.4 Battered piles shall be installed to within four percent of the specified batter as determined by the angle from horizontal.

3.4 PILE LOAD TESTS

3.4.1 General

- The Piling Contractor’s proposed load test set up, equipment and testing procedures shall be submitted to the Engineer and Geotechnical Engineer for approval prior to performing the load tests as required below.
- Install test piles in the locations and depth as determined by the Piling Contractor and based on design criteria as shown on the Drawings. Installation of the test piles and reaction piles shall be to the same tolerance as applicable for the production piles. The Geotechnical Engineer’s Representative shall monitor the installation of the test and reaction piles.
- The grout shall reach the required design strength before applying test loads.
- Perform the load tests to the loads indicated within this specification using the “Standard Loading Procedures” referenced in ASTM D1143, D3966 and D3689 and compile complete records for all test piles indicated, under the observation and with the consultation of the Geotechnical Engineer.

3.4.2 Static Axial Compressive Load Test:

- The compressive load tests shall be conducted in accordance with ASTM D1143.
- The maximum test load shall be at least 200 percent of the design compressive load.
- The maximum load application shall be held and monitored for a period of 2 hours.
- The test and reaction piles shall not be used as production piles.

3.4.3 Lateral Load Test:

- The lateral load tests shall be conducted in accordance with ASTM D3966.
- The maximum test load shall be limited to that load which produces ½-inch of lateral deflection for safety and load stability reasons.
- The test and reaction piles shall not be used as production piles.

3.4.4 Static Axial Tensile Load Test:

- The tensile load tests shall be conducted in accordance with ASTM D3689.
- The maximum test load shall be at least 200 percent of the design tensile load.
- The test and reaction piles shall not be used as production piles.

3.4.5 Strain Gauges for Load Tests

Provide a minimum of four strain gauges per test pile.

3.5 EVALUATION OF PILE TESTS

The Geotechnical Engineer shall analyze test pile results and shall determine from these results the depth of pile to be used for each pile location.

3.6 PRODUCTION PILES

Production piles shall be installed in the same manner as the test piles (except as directed by the Geotechnical Engineer) to the depth determined by the Geotechnical Engineer from the load test results.

3.7 AUGER-GROUTED PILING

3.7.1 General. Auger-grouted piles shall be placed by rotating a continuous flight hollow-shaft auger into the ground to a predetermined pile depth. Grout is then injected through the auger shaft as the auger is being withdrawn in such a way as to exert removing pressure on the withdrawing earth-filled auger as well as lateral pressure on the soil surrounding the grout-filled pile hole. The specified installation procedure shall be used at all times, even when the hole is sufficiently stable to retain its shape without support from the earth-filled auger. Auger withdrawal rate should not exceed 10 feet per minute unless a faster rate can be demonstrated to be acceptable.

3.7.2 *Location of Equipment.* Unless otherwise approved by the Geotechnical Engineer, the augering equipment shall be located not closer than 10 feet from the location of a pile being installed and not closer than 10 feet from any pile grouted within the previous 24 hours.

3.7.3 *Termination of Augering.* Augering for each pile shall be terminated in accordance with on-the-site instructions of the Geotechnical Engineer's Representative.

3.7.4 *Obstructions.* If the Geotechnical Engineer's Representative determines that an obstruction causes auger refusal, as defined, to be reached prematurely, installation of the pile shall be terminated. The Geotechnical Engineer shall instruct the Contractor how to proceed further to provide support for the load assigned to that particular pile.

3.7.5 *Batching and mixing grout.* All grout shall be batched in accordance with the approved mix design and shall be homogeneously mixed to the desired consistency. When measured for fluidity by ASTM C939, flow rates shall be in the range of 10 to 25 seconds when using a flow cone with a 3/4 inch opening, or as approved by the Geotechnical Engineer.

3.7.6 *Pumping of Grout.* After achieving the desired pile tip depth, a positive grout pressure should be observed prior to initiating withdrawal of the auger. As the auger is withdrawn, specified grout shall be pumped through the opening provided at the bottom of the auger with sufficient pump pressure and sufficient grout volume to fill the hole, to prevent hole collapse, and to cause the lateral movement of the grout into any soft or porous zones of the surrounding soil. This pressure, measured at the pump, shall not be less than 200 psi, or as approved by the Geotechnical Engineer.

3.7.7 The auger should be withdrawn slowly and smoothly so that a positive grout pressure head is maintained in the hole at all times during auger withdrawal. Until the grout reaches the top of the pile, a head of ten or more feet of grout above the injection point shall be carried around the perimeter of the auger flighting at all times during the raising of the auger, so that the grout has a displacing action removing any loose material from the hole. Grout shall be placed within 90 minutes of batching.

3.7.8 Rate of grout injection and auger withdrawal from the soil shall be coordinated so as to maintain a steady positive pressure on the grout pressure gauge at all times and to insure that the minimum required grout volume is placed in every five foot increment of the pile. The auger shall not be rotated during withdrawal except as allowed by the Geotechnical Engineer's Representative.

3.7.9 The minimum volume of grout placed in the augered excavation shall be equal to the theoretical volume of a "true" hole plus fifteen percent (to account for an increased hole diameter due to auger warp and lateral soil displacement due to grout pressure).

3.7.10 The Contractor shall determine the volume of grout per pump stroke and the minimum number of strokes required for each five feet of auger withdrawal (to pump a grout volume equal to 115% of the theoretical hole volume). This data is to be verified by the Geotechnical Engineer's Representative.

3.7.11 The Contractor shall mark the "leads" of the installation rig at five-foot increments in such a manner as to be clearly visible to an inspector located at the pump.

3.7.12 If grout subsidence occurs after auger removal (due to bulging of the grout column in very loose clayey sand or very soft clay zones, for example), the pile should be topped off with grout as necessary. If the grout becomes contaminated with soil as its level recedes, then it will be necessary to either manually remove the contaminated grout before topping off

the pile, or insert the grout hose into the fluid grout in the pile and pump grout below the contaminated zone to “flush out” the contaminated grout.

3.7.13 Automated Monitoring Equipment (AME) may be used to monitor the following items; however, it does not replace the field inspection by the Geotechnical Engineer.

- Auger Depth
- Installation Drilling Rate
- Grout Volume Pumped Per Unit Depth Increment
- Minimum and Maximum Grout Pressure
- Angle of Installation
- Number of Auger Revolutions, or Speed of Rotation

3.7.14 *Inspection.* The Geotechnical Engineer's Representative shall monitor the complete installation of each pile. He shall confirm the length of each pile, the volume of grout placed in each five-foot length of the pile, the maintenance of adequate grout pump pressure, the rate of auger withdrawal, and general compliance with the specifications.

3.7.15 *Grout.* Grout at top of pile shall be fully confined laterally either by the sides of a well defined auger excavation, which extends at least 6 inches higher than the pile cut-off level, or by a steel tube of suitable diameter centered over the pile and extending at least one-foot below the level at which firm augered excavation edges occur.

3.7.16 *During a Temporary Interruption.* When placing of grout is interrupted for more than 15 minutes (or as determined by the Geotechnical Engineer's Representative), the auger and hose shall be retracted and any grout remaining in the truck shall be continuously circulated through the pump during the interruption period. Following permission by the Geotechnical Engineer's Representative to resume operations, the hole shall be re-augered; then, placing of approved grout shall begin again.

3.7.17 *Installation of Low-Headroom Piles.* After having temporarily disconnected the grout line to remove a portion of the auger, the hole shall be re-augered at least five feet before grout placement resumes, unless the Geotechnical Engineer's Representative determines that additional re-augering is required.

3.7.18 *Starting of Adjacent Piles*. The sequence of pile installation shall be such that adjacent piles show no evidence of disturbance. Piles shall not be installed within 6-pile diameters center-to-center of a pile grouted within the previous 24 hours nor within 5 feet of a pile grouted within the previous 72 hours.

3.7.19 *Testing Grout.* Cubes or cylinders for testing grout prior to placing shall be made and tested by the Testing Laboratory in accordance with ASTM C109, with the exception that the grout shall be restrained from expansion by top and bottom plates held in place with two "C" clamps. At least two sets of six, 2-inch square grout cubes, or 3-inch diameter by 6-inch long grout cylinders shall be made during each day of pile installation, two of which shall be tested at 7 days, two of which shall be tested at 28 days, and two of which shall be kept in reserve for use as may be required.

3.8 PLACING REINFORCEMENT

All reinforcement required shall be placed as detailed immediately after removal of the auger (while grout is still fluid), or as noted on the Drawings. Placement of reinforcement shall include vibratory equipment as required.

3.9 PILE CUT-OFF

The final elevation of the top of the pile shall be set by either "dipping" the grout while it is in a fluid state or cutting off the pile after the grout has hardened (at the Contractor's option).

3.10 PILES INCORRECTLY INSTALLED

If, due to Contractor error or negligence, any piles that are not correctly positioned or are otherwise incorrectly installed, all work required to fulfill the requirements of the Drawings and Specifications to the satisfaction of the Owner's Representative shall be performed by the Contractor at no additional cost to the Owner. Unless otherwise provided, augered holes that cannot be used shall be filled with grout.

3.11 QUALITY CONTROL

During pile installation, the following quality control observations shall be performed by qualified geotechnical personnel.

- Monitor the installation procedures to check that the tip depths are properly achieved and that auger withdrawal techniques are sufficient to remove loose cuttings from the pile.
- Monitor and record the rate of auger penetration and withdrawal.
- Check and calibrate the equipment for controlling and measuring the flow rate of grout into the pile.
- Monitor the ratio of actual grout take to the theoretical hole pile volume.
- Monitor the installation of steel reinforcement.
- Check the fluid grout level in completed piles during installation of an adjacent pile.
- Sample and test specimens of the fluid grout. Mold at least two sets of 2-inch by 2-inch grout cubes or 3-inch diameter by 6-inch long grout cylinders, each day during pile production, for compressive strength testing.

3.12 APPLICATION OF LOAD TO COMPLETED PILING

The results of compression testing of representative grout placed in a particular pile shall be equal to or greater than the minimum compressive strength required. Any corrective work required shall be accomplished before any load is applied to this pile.

3.13 CLEANING UP

At the end of each day of work all debris and excess materials generated by the piling installation at the location of each completed pile shall be removed to designated spoil areas, or as directed by the Owner’s Representative.

3.14 SPECIAL INSPECTION

The required verification and inspection of auger-grouted piling (cast-in-place deep foundation elements) shall be in accordance with the International Building Code, Section 1704 “Special Inspections, Contractor Responsibility and Structural Observations”, Section 1705 “Required Verification and Inspection” and Table 1705.8.

In addition, refer to Section SECTION 014533, Special Inspections and Tests, of the Construction Specifications.

END OF SECTION

CONSTRUCTION SPECIFICATION

wood.

TITLE: **Drilled Piers**	PROJECT DOC. NO.: **143993-ASA-DD2-SPC-1301**	REV. **0**	
PROJECT NAME: **D.B. Wilson Station FGD Retrofit Project**	PROJECT NO.: **245891**		
CLIENT: **Big River Electric Corporation**	AREA NO.:		

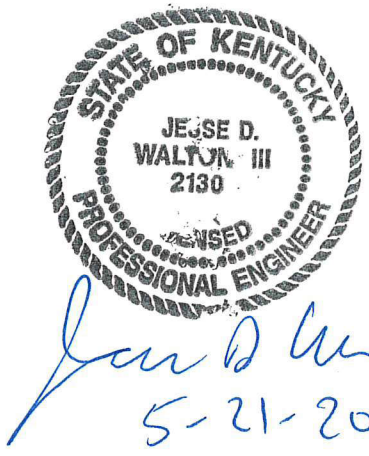
APPROVAL STATUS							
PREPARED BY:	DRF	**DATE**	10FEB21	**CHECKED BY:**	SCK	**DATE**	23FEB21
APPROVED BY:	JDW	**DATE**	12FEB21	**APPROVED BY:**	CLF	**DATE**	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 316329

DRILLED PIERS

1.0 GENERAL

1.1 SCOPE

This Specification includes all materials, labor, equipment and services required to install drilled pier foundations, in accordance with the Drawings, Construction Specifications, and Scope of Work Document.

Work on this project shall conform to all the requirements of ACI Specification 336.1-01 published by the American Concrete Institute, Farmington Hills, Michigan, except as modified by this Construction Specification and the Scope of Work Document.

Where there is a discrepancy between the Drawings and this Specification, the Drawings shall take precedence.

1.2 OTHER PROJECT SPECIFICATION SECTIONS REFERENCED HEREIN

- Cast-In-Place Concrete – SECTION 033000
- Special Inspections and Testing – SECTION 014533

1.3 PUBLICATIONS REFERENCED HEREIN (Latest edition unless noted)

- American Concrete Institute (ACI), "Specification for the Construction of Drilled Piers (ACI 336.1-01)". Attachment 1 to this Construction Specification.
- OSHA Regulations – 29 CFR Part 1910 Occupational Safety and Health Standards
- OSHA Regulations – 29 CFR Part 1926 Safety and Health Regulations for Construction
- 2015 International Building Code, Chapter 17 Special Inspections and Tests

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership or corporation responsible for providing the drilled piers and all scope of work defined herein.

1.4.2 Owner. Big River Electric Corporation.

1.4.3 Owner's Representative. The authorized representative of the Owner.

1.4.4 Engineer. Wood, doing business as AMEC Foster Wheeler Industrial Power Company, Inc.

1.4.5 Others. Any vendor, contractor, etc., other than the Contractor and Owner herein defined.

1.4.6 Geotechnical Engineer. An independent soils engineering consultant, engaged by the Owner, who shall determine installation criteria in consultation with the Engineer and shall perform inspection services as required. The Geotechnical Engineer shall be licensed in the State of Kentucky.

1.4.7 Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform testing services required in this section not otherwise designated, and to perform any such services requested by the Owner's Representative.

1.4.8 Special Inspections. Inspections required by the International Building Code, Chapter 17, for the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with the approved construction documents and reference standards.

1.4.9 Rock. Any natural material which cannot be removed with a fully operative earth boring machine equipped with a conventional earth auger.

1.4.10 Earth. Any material not classified as rock which can be removed with the earth auger.

1.5 SUBMITTALS

1.5.1 General. All submittals required by this specification and ACI 336.1 shall be to the persons or parties identified in the contract documents.

1.5.2 Certification of Contractor's Qualifications. See Paragraph 1.9.1.

1.5.3 Detailed description of the proposed method of performing each stage of the work including type of equipment to be used and details and function of any proposed hardware or miscellaneous items.

1.5.4 Concrete Design Mix Reports, Mill Test Reports, Reinforcing Steel Shop Drawings, and Production Concrete Test Reports shall be submitted as required by the Cast-In-Place Concrete Specification SECTION 033000.

1.5.5 Contractor's drilling log.

1.5.6 Geotechnical Engineer's inspection reports and final report.

1.5.7 The contract price, unless otherwise specified, shall be a unit price contract with a scope including all drilled pier work shown on the Drawings. This price shall be based on the Contractor's interpretation of all available information and there shall be no allowances or credits permitted for rock removal, additional test holes, or any other reason, except changes required by revisions initiated by the Engineer. The contract price shall include a charge per foot for those drilled piers which must be taken deeper than the design depth shown on the Drawings.

1.6 SUBSURFACE SOIL INFORMATION

Reports of subsurface soil investigations pertaining to this project are available from the Owner upon request. The contents of these reports are offered only as general information. These reports were prepared only for the Owner's and Engineer's use in design and do not form a part of this contract. These reports are not a warranty of subsurface conditions. The referenced report is "Report of Geotechnincal Engineering Study Addition to D. B. Wilson Station Big Rivers Electirc Corporation Centertown, Kentucky", Wood Environment & Infrastructure Solutions, Inc., 216 Centerview Drive, Suite 300, Brentwood, Tennessee 37027, Wood E&IS Project No. 7382-20-9000, dated 30 November 2020.

1.7 PERMANENT PROPERTY MARKERS

All established boundary markers and bench marks on the site shall be sufficiently referenced prior to the beginning of the Work to keep easy reference to lines and grades intact during the progress of the work. Any such markers disturbed or destroyed shall be replaced at the Contractor's expense.

1.8 SAFETY MEASURES

The Contractor and others engaged in performing the work for this specification shall perform their work in a safe manner in accordance with OSHA regulations and all safety requirements of the Owner.

The Contractor shall take all precautions necessary to protect the safety of anyone who is required to descend into any excavation.

1.9 QUALITY ASSURANCE

1.9.1 Drilled Pier Installer Qualifications.

1.9.1.1 Installer shall have a minimum of five years of successful experience and a minimum of five successful installations on projects of a similar size and scope to this project and of using similar installation methods as may be anticipated for this project. Individual drill rig operators shall have a minimum of three years of experience in installing drilled piers similar to those used for this project. Prospective drilled pier installers shall present their resume of applicable experience as well as the resumes of individual rig operators.

1.9.1.2 The drilled pier installer's record of the expeditious completion as well as the accurate installation of drilled pier work will be of prime consideration in qualifying the drilled pier installer for this project.

1.9.1.3 The drilled pier installer shall visit and examine the work site and observe conditions thereon and take into consideration such conditions that may affect this work. Claims for additional compensation for extra costs incurred because of failure to examine the site will not be recognized.

1.9.2 Geotechnical Engineer

1.9.2.1 A Geotechnical Engineer will be engaged by the Owner to observe the installation of the drilled piers.

1.9.2.2 It shall be the responsibility of the drilled pier installer to coordinate his activities with the Geotechnical Engineer and provide adequate notice to the Geotechnical Engineer of all anticipated activities.

1.9.2.3 The Geotechnical Engineer shall perform all inspections as required to ensure a complete, correct installation of the drilled piers. A copy of all inspection reports shall be submitted to the Engineer.

1.9.3 Each excavation shall be inspected and approved by the Geotechnical Engineer after cleaning and prior to placing any reinforcement or concrete.

1.9.4 The elevations of the bottoms of the drilled piers shown on the Drawings are estimated. The actual elevations required to obtain the specified bearing capacity shall be determined by the Geotechnical Engineer from his inspections and tests.

1.9.5 The locations of the drilled piers shall be established by a surveyor registered in the State of Kentucky. The Surveyor shall be paid by the Contractor unless otherwise specified.

The centerline of each drilled pier shall be located on the centerline of the supported construction unless shown otherwise on the Drawings.

1.9.6 The following tolerances will be permitted:

1.9.6.1 The centerline location must be within 4.2 percent of shaft diameter or 3 inches (whichever is less) of that shown on the Drawings. Anchor bolts shall be located within 1/8 inch of the location shown.

1.9.6.2 The drilled pier shall be plumb within 1 inch in 8 feet for the entire length of the drilled pier.

1.9.6.3 The slope of the bottom excavation, if any slope, shall not exceed 1 vertical to 12 horizontal unless approved by the Geotechnical Engineer.

1.9.6.4 The diameter shall always be at least 98 percent of that shown on the Drawing.

1.9.7 If the tolerances specified in Paragraph 1.9.6 are exceeded, it shall be the responsibility of the Contractor to design a corrective procedure which must be approved by the Geotechnical Engineer and the Engineer prior to the implementation of the procedure.

1.9.8 A report shall be kept by the Geotechnical Engineer for each drilled pier. When required, the Contractor's surveyor shall assist the Geotechnical Engineer in obtaining the required information. As a minimum, the report shall contain the following information:

- identifying drilled pier number
- date of excavation
- bottom elevation, slope of bottom if any
- soil stratum and bearing capacity at bottom
- seepage of water
- still water level
- location
- plumbness
- date when concrete was placed
- concrete placement inspection notes (concrete quantities, concrete truck number(s), reinforcing steel placement)
- top elevation
- any unusual condition
- information regarding casings if used (size, length)
- statement of Geotechnical Engineer accepting or rejecting drilled pier
- signature of Geotechnical Engineer

Upon completion of the drilled pier installation and any required remedial work, the Geotechnical Engineer shall submit a written report stating that, in his opinion, the drilled piers which he has inspected have been installed in accordance with the Drawings and

Specifications. This report shall bear the seal and signature of a professional Geotechnical Engineer registered in the State of Kentucky.

2.0 PRODUCTS

2.1 CAST-IN-PLACE CONCRETE AND REINFORCING STEEL

All cast-in-place concrete and reinforcing steel shall conform to the applicable portions of the Cast-In-Place Concrete Specification SECTION 033000, except that slump shall be 5 inches plus or minus one inch, if corresponding proportioning requirements are met.

2.2 FORMS

Forms for the portion of the drilled pier projecting above grade shall be Sonotube Fibre Forms as manufactured by Sonoco Products Company, Hartsville, South Carolina, or an Engineer approved equal.

3.0 EXECUTION

3.1 GENERAL

Drilled pier construction shall conform to all requirements of ACI 336.1-01 published by the American Concrete Institute, except as modified by the requirements of this Construction Specification. The Contractor shall have a copy of ACI 336.1-01 on site at all times.

3.2 PROTECTION OF SURROUNDING PROPERTY AND EXISTING STRUCTURES

3.2.1 *Surrounding Property.* Surrounding property shall be adequately protected from damage resulting from the presence of water, mud and silt during construction. Local, County and State regulations pertaining to storm and waste water runoff shall be strictly observed.

3.2.2 *Existing or Adjacent Structures and Piers.* Drilled piers shall be installed by a method which gives due consideration for the safety of adjacent structures and piers, which leaves their strength unimpaired and which develops and retains the required load bearing capacity of the existing structure's foundation or adjacent pier. Where closely spaced piers are required, each pier will be complete prior to drilling the next adjacent pier unless specific approval from the Geotechnical Engineer is obtained to proceed with drilling in cased holes.

3.3 PREPARATION FOR DRILLING

The Contractor shall perform any grading of existing surface necessary for operation of equipment and shall accurately lay out drilled pier locations as indicated, subject to the approval of the Owner's Representative.

3.4 EARTH EXCAVATION AND STEEL CASING INSTALLATIONS

3.4.1 *General.* At each drilled pier location indicated, earth shall be excavated and a reinforced concrete pier shall be installed as indicated. Materials removed from the excavation shall be kept clear of the opening at the top, allowing easy, safe access to the opening all around its edge.

3.4.1.1 Excavate holes for closely spaced drilled piers (piers who's center are within five times their average diameter, or as otherwise specified by the Geotechnical Engineer) only after adjacent holes are filled with concrete and allowed to set.

3.4.1.2 Remove from bottom of the excavation loose material or free water in quantities sufficient to cause settlement or affect concrete strength as determined by the Geotechnical Engineer. Excavate pier bottoms to a level plane, as approved by the Geotechnical Engineer. If bottoms are sloping rock, excavate to a level plane or step with maximum step height less than one-quarter the width or diameter of the bearing area.

3.4.1.3 In drilling the holes, the earth walls shall be adequately and securely protected, when necessary, against cave-ins, displacement of the surrounding earth and for the retention of ground water by means of temporary steel cylinder liners or casings. If casings are required, they shall have an outside diameter not less than the specified shaft size. The Geotechnical Engineer shall determine if steel casings are required.

3.4.1.4 Where the Geotechnical Engineer determines that the foundation material is sufficiently stable for the hole to retain its shape without support, the earth filled auger may be removed after the hole has been drilled to the proper depth.

3.4.1.5 Uncased or belled excavations shall not be left open overnight.

3.4.1.6 Ream or cut bells of drilled piers to the angles and dimensions shown on the Drawings.

3.4.2 *Test Holes.* The Geotechnical Engineer shall determine the number and location of holes, not less than 1 in every 10 piers, in order to best determine the bearing value of the strata tested. If the bearing material proves unsatisfactory, the pier shall be carried deeper to satisfactory bearing material and retested.

At drilled piers which are to bear on rock, after the excavation has reached rock, any required casing installed, and the bottom dewatered and cleaned of loose and water-softened material, pneumatically drill one 2-inch diameter test hole in the bottom of piers 36 inches or less in diameter (two holes in piers more than 36 inches in diameter), or as otherwise directed by the Geotechnical Engineer. Unless otherwise directed by the Geotechnical Engineer, drill these test holes to depths equal to 2.0 times the shaft diameters of the piers in which they are located, into the rock-bearing material.

3.5 CONCRETE WORK AND STEEL CASING WITHDRAWAL

3.5.1 *General.* Except as otherwise indicated, the installation of concrete shall be in accordance with the Cast-In-Place Concrete Specification SECTION 033000.

3.5.2 *Preparation for Concrete Placing.* Dewater each drilled pier excavation in accordance with ACI 336.1 and as directed by the Geotechnical Engineer.

3.5.3 *Placing Concrete.* After the Geotechnical Engineer has determined that a drilled pier location has been satisfactorily put in readiness, concrete shall be placed. When placing of concrete under water cannot be avoided, the Contractor shall use tremie pipe or pumping procedure, as approved by the Geotechnical Engineer, and in accordance with ACI 336.1, in order to force the water up from the bottom as the concrete is deposited.

3.5.4 *Steel Casing Withdrawal.* At each drilled pier location, the Contractor shall withdraw the steel casing only as the pier shaft is filled with concrete, maintaining an adequate head of concrete above the bottom of the casing to balance outside soil and water pressure at all times during withdrawal, subject to the approval of the Geotechnical Engineer.

3.5.5 *Vibration of Concrete.* After the steel casing has been removed, the Contractor shall vibrate the top 5-feet of concrete.

3.6 DRILLING LOG

An accurate log of each drilled pier as it is installed shall be kept by the Contractor, indicating description of material encountered, exact pier location and number, elevations of each earth and rock strata, height of water table, and any other pertinent data. The Geotechnical Engineer and the Owner's Representative shall have access to this log at all times.

3.7 TESTING

3.7.1 Testing of concrete shall be in accordance with the Cast-In-Place Concrete Specification SECTION 033000.

3.7.2 Integrity Testing

Provide either Crosshole Sonic Logging (CSL) or Sonic Caliper Logging (SCL) which are two methods of integrity testing for drilled piers. Test a minimum of 5%, but not less than 5 drilled piers using one of the methods.

3.7.3 Load Testing - **DELETED**

3.7.4 Construction and testing of drilled piers shall be monitored by the Geotechnical Engineer or his field representative on a full-time basis.

3.8 CLEANING OF THE SITE

All debris and excavated material shall be removed from the site or otherwise disposed of as directed by the Owner's Representative.

3.9 SPECIAL INSPECTION

The required verification and inspection of drilled piers (cast-in-place deep foundation elements) shall be in accordance with the International Building Code, Section 1704 “Special Inspections, Contractor Responsibility and Structural Observations”, Section 1705 “Required Verification and Inspection” and Table 1705.8.

In addition, refer to SECTION 014533, Special Inspections and Tests, of the Construction Specifications.

END OF SECTION

ATTACHMENT 1 – ACI 336.1-01

CONSTRUCTION SPECIFICATION

TITLE:	**CAST-IN-PLACE CONCRETE**	PROJECT DOC. NO.:	**143993-ASA-DD2-SPC-1302**	REV. **0**
PROJECT NAME:	**D.B. Wilson Station FGD Retrofit Project**	PROJECT NO.:	**245891**	
CLIENT:	**Big River Electric Corporation**	AREA NO.:		

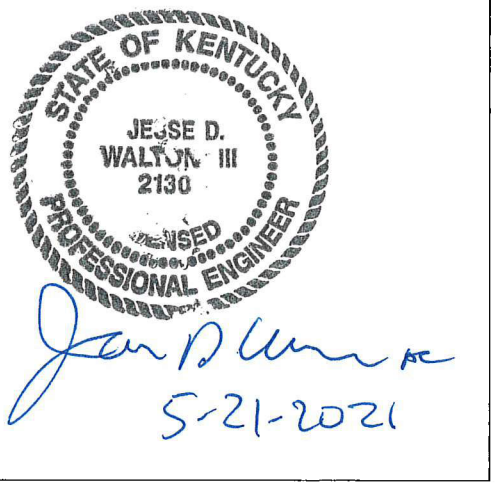
APPROVAL STATUS							
PREPARED BY:	DRF	**DATE**	10FEB21	**CHECKED BY:**	SCK	**DATE**	23FEB21
APPROVED BY:	JDW	**DATE**	12FEB21	**APPROVED BY:**	CLF	**DATE**	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 033000

CAST-IN-PLACE CONCRETE

1.0 GENERAL

The purpose of this Specification is to ensure compliance with the American Concrete Institute ACI 301 "Specifications for Structural Concrete", December, 2010. It is the intent of this Specification to conform to the requirements of ACI 301-10 as a minimum standard.

1.1 SCOPE

This section includes all materials, labor, equipment and services required for the installation of all plain and reinforced cast-in-place concrete (including formwork, reinforcement, reinforcement supports, embedded items detailed on the concrete drawings, joint fillers, joint sealers, and waterstops) and all related activities, in accordance with the Drawings, Construction Specifications and Scope of Work Document.

Where there is a discrepancy between the Drawings and this Specification, the Drawings shall take precedence.

1.2 OTHER PROJECT SPECIFICATION SECTIONS REFERENCED HEREIN

- Grout – SECTION 036000
- Structural Steel and Miscellaneous Metal Fabrication and Erection - SECTION 051200
- Structural Inspections and Tests – SECTION 014533
- Precast-Prestressed Concrete – SECTION 034000 **HOLD**

1.3 PUBLICATIONS REFERENCED HEREIN (Latest edition unless noted)

All work shall conform to the requirements of these codes and standards, unless noted otherwise.

- American Concrete Institute (ACI) as listed:
- ACI 117 *Specification for Tolerances for Concrete Construction and Materials*
- ACI 301 *Specifications for Structural Concrete*
- ACI SP-66 *ACI Detailing Manual - 2004*
- ACI 207.1R *Guide to Mass Concrete*
- ACI 350 *Code Requirements for Environmental Engineering Concrete Structures*
- American Society for Testing and Materials (ASTM), Standards as indicated
- CRD-C 572 *Corps of Engineers Specifications for Polyvinylchloride Waterstops*
- CRD-C 48 *Standard Test Method for Water Permeability of Concrete*

- Concrete Reinforcing Steel Institute, *Manual of Standard Practice*
- American Association of State Highway and Transportation Officials (AASHTO), T 260, *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials*
- American Welding Society, AWS D1.4 *Structural Welding Code - Reinforcing Steel*
- OSHA Regulations – 29 CFR Part 1910 Occupational Safety and Health Standards
- OSHA Regulations - 29 CFR Part 1926 Safety and Health Regulations for Construction
- 2015 International Building Code, Chapter 17 Special Inspections and Tests

Note: The Contractor shall keep a copy of ACI Field Reference Manual, ACI SP-15, containing ACI 301 and other selected ACI and ASTM references pertaining to concrete, at the jobsite.

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and Scope of Work Document.

1.4.2 Owner. Big River electric Corporation.

1.4.3 Owner's Representative. The authorized representative of the Owner.

1.4.4 Engineer. Wood, doing business as AMEC Foster Wheeler Industrial Power Company, Inc.

1.4.5 Fabricator. The contractor fabricating the reinforcing steel.

1.4.6 Others. Any vendor, contractor, etc., other than the Contractor and Owner herein defined.

1.4.7 Embedded Items. All bolts, inserts, sleeves, conduit, fixtures and other material placed so as to become anchored in concrete, as indicated and specified elsewhere in the contract documents.

1.4.8 Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform testing services required in this section not otherwise designated, and to perform any other such services requested by the Owner's Representative.

1.4.9 Concrete Design Mix. A concrete design mix is the quantities of specific ingredients which, when mixed, will yield one cubic yard of concrete of a given strength, slump, and air content. Any variation in admixtures, cement or water content, or of any other ingredient, shall constitute a different design mix.

1.4.10 Hydraulic Structures. Concrete structures which have as their primary purpose the containment, conveyance or processing of liquids and are designed to provide water tightness in accordance with ACI 350.

1.4.11 Special Inspections. Inspections required by the International Building Code, Chapter 17, for the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

1.4.12 Definitions of other terms used in this specification, not defined where used or elsewhere in the contract documents, shall be as given in ACI 301.

1.5 SUBMITTALS

1.5.1 *General*. All submittals required by this specification shall be to the persons or parties identified in the contract documents.

1.5.2 *Concrete Design Mix Reports*. Design mix reports for each proposed concrete design mix shall be submitted. These submittals shall include the results of all tests performed to qualify the materials (including determination of chloride ion concentration) and to establish each design mix. No concrete shall be placed until the design mix for that concrete is accepted.

1.5.3 *Concrete Permeability*. Certified test results, showing that the water permeability of concrete proposed for use in any hydraulic structure designed to contain liquids satisfies the requirements of Paragraph 2.22.15, shall be submitted prior to the placement of any such concrete.

1.5.4 *Mill Test Reports*. Certified test reports, showing compliance with the required standards, shall be submitted for any or all materials proposed for use on the project, if required by the Owner's Representative. When so required, such test reports shall certify that the material tested is of the same quality as that proposed for use on this project.

1.5.5 *Reinforcing Steel Shop Drawings*. Reinforcing steel shop drawings shall be submitted for review prior to fabrication. They shall conform to the requirements of ACI SP-66 and shall include placement plans, bar details and bills of materials. Fabrication shall not be started until the submitted shop drawings have been reviewed, and marked "Released for Production," by the Engineer.

1.5.6 *Production Concrete Testing*. The Contractor and the testing laboratory shall report the results of all tests and inspections immediately after they are performed. Reports on strength tests shall include, in addition to the information required by ASTM C39, the following:

- Project name and Wood project number
- Air temperature and temperature of concrete at time of sampling
- Slump of sample
- Air content of sample, percent
- Location where the concrete represented by the sample was deposited
- Name of person who molded the test cylinders
- Description of storage and curing conditions prior to testing

- Batching information (amount of concrete, time loaded or mixed, concrete design mix designation, type and brand of cement and any admixtures, total mixing water, maximum aggregate size, weights of ingredients, and amount of added water)

Note: ASTM C94 requires that the batching information be shown on the delivery ticket.

1.5.7 *Special Inspections Reports.* All special inspections reports shall be prepared and submitted as described in SECTION 014533, Special Inspections and Tests, of the Construction Specifications.

1.6 SAFETY

1.6.1 The Contractor, Fabricator and others engaged in performing the work for this specification shall perform their work in a safe manner in accordance with OSHA regulations and all safety requirements of the Owner.

2.0 PRODUCTS

2.1 GENERAL

All materials shall be new and shall conform to the respective specifications and other requirements specified herein, unless otherwise indicated.

2.2 QUALITY OF MATERIALS

When selecting materials, the Contractor shall confirm the availability of certified test reports showing compliance with all required standards. See SUBMITTALS, Paragraph 1.5.4.

2.3 CEMENT

All cement shall be Portland Cement conforming to ASTM C150, Type II (moderately sulfate resistant), and shall all be of one brand produced at a single cement manufacturing plant.

2.4 ADMIXTURES

2.4.1 All admixtures shall be compatible with all other concrete mix ingredients and reinforcing steel, and with the intended use of the concrete. No admixtures shall be used without the consent of the Owner's Representative. All admixtures shall be furnished by the same manufacturer and shall be certified by the manufacturer as compatible.

2.4.2 Admixtures to be used in concrete, when permitted, shall conform to the following specifications:

- ASTM C260 Air-Entraining Admixtures for Concrete
- ASTM C494 Chemical Admixtures for Concrete
- ASTM C618 Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- ASTM C989 Slag Cement for Use in Concrete and Mortars

Note: Cementitious or pozzolan admixtures vary in their effect on concrete mixes, therefore, before such an admixture can be used, they must be tested as part of the design mix to determine the effect on the water requirements, concrete strength, shrinkage and durability of the concrete. All such cementitious or pozzolan admixtures used must be from a single source and shall not exceed 25 percent by weight of the total cementitious material in the design mix.

2.4.3 Admixtures shall not contain calcium chloride and shall be used in accordance with the manufacturer's instructions.

2.5 WATER

Mixing water shall meet the requirements of ASTM C94 Ready-Mix Concrete.

2.6 AGGREGATES

Aggregates shall conform to the requirements of ASTM C33 Concrete Aggregates.

Note: See Paragraph 2.22.9 for maximum permitted aggregate size. Lightweight concrete shall be used only where specified on the Drawings.

2.7 CHLORIDE ION CONCENTRATION

Maximum water soluble chloride ion concentration in hardened concrete at ages 28 to 42 days contributed from the ingredients of the concrete including water, aggregates, cement, and admixtures shall not exceed 0.10 percent, by weight, of the cement, unless otherwise specified. The water soluble chloride ion concentration in each proposed concrete design mix shall be determined by testing in accordance with ASTM C1218 Water-Soluble Chloride in Mortar and Concrete.

2.8 MATERIAL STORAGE AND HANDLING

2.8.1 Store and handle concrete reinforcement in accordance with ACI 301, Section 3.1.2. Reinforcement shall be stored clear of the ground and protected from the formation of rust and other damage.

2.8.2 Store and handle cementitious materials, aggregates, water and ice, and admixtures in accordance with ACI 301, Section 4.1.4.

2.9 FORMWORK

All material for formwork shall conform to the requirements of ACI 301, Section 2.

2.10 REINFORCEMENT

Reinforcement material shall conform to the requirements of ACI 301, Section 3.2. All reinforcing bars shall be Grade 60, unless noted otherwise on the Drawings.

2.11 BAR SUPPORTS

Bar supports shall be designed and fabricated in accordance with the Manual of Standard Practice by the Concrete Reinforcing Steel Institute and shall be steel or precast concrete blocks. Precast concrete blocks shall be not less than 4 inches square when supporting reinforcement on the ground. Precast concrete blocks shall have a compressive strength not less than that of the surrounding concrete. Wire bar supports in contact with forms for concrete to be left exposed shall conform to Class 1 Maximum Protection. All other wire bar supports may conform to Class 2 Moderate Protection as defined in the CRSI Manual of Standard Practice, Chapter 3.

2.12 SLAB ON GRADE DOWELS

Slab on grade dowels shall be smooth round bars conforming to ASTM A36 minimum.

2.13 EMBEDDED ITEMS

See SECTION 05130, Structural Steel and Miscellaneous Metal Fabrication and Erection, of the Construction Specifications.

2.14 PREMOLDED EXPANSION JOINT FILLER

Premolded expansion joint filler material shall conform to ASTM D1752, Type I or II, or to ASTM D1751.

Note: If ASTM D1751 joint filler material is used, backer material compatible with the joint sealer shall be used between the joint sealer and the joint filler material. Such backer material must provide a complete permanent separation of the joint filler and the joint sealer.

2.15 ELASTOMERIC JOINT SEALANT

Joint sealant shall be a multicomponent selfleveling sealant conforming to ASTM C920, Type M, Grade P, Class 50.

2.16 JOINT BACK-UP MATERIAL

Joint back-up material shall be a closed-cell, polyethylene foam backer-rod conforming to ASTM C1330, Type C.

2.17 EPOXY OR POLYUREA JOINT FILLER

Joint filler shall be a two-component, semi-rigid epoxy or polyurea material with 100% solids and a minimum Shore A Hardness of 80 when measured in accordance with ASTM D2240.

2.18 WATERSTOPS

Waterstops shall conform to Corps of Engineers Specification CRD-C 572, with polyvinylchloride as the basic resin, and shall have a dumbbell configuration, unless noted otherwise on the Drawings.

2.19 CURING MATERIALS

2.19.1 Waterproof sheet material (such as polyethylene film) shall conform to ASTM C171.

2.19.2 Membrane curing compound material shall conform to ASTM C309, Type I-D with fugitive dye. Materials containing wax, silicones or other ingredients detrimental to subsequent floor finishes are not acceptable.

2.19.3 Other suitable materials, which when saturated over a period of time will not stain the concrete or otherwise be detrimental to the work may be used if approved by the Owner's Representative.

2.20 GROUT

See Section 036000, GROUT, of the Construction Specifications.

2.21 EPOXY BONDING AGENT

Epoxy Bonding Agent shall be Sika Armatec 110 EpoCem, a three-component, solvent-free, moisture-tolerant, epoxy-modified, cementitious bonding agent with extended "open" time, mixed and applied in accordance with the manufacturer's recommendations, unless otherwise specified.

2.22 PROPORTIONING OF CONCRETE DESIGN MIX

2.22.1 *General.* All concrete shall be of the specified quality and capable of being placed without excessive segregation. When hardened, concrete shall develop all characteristics required by these specifications and the contract documents.

2.22.2 *Strength*. The specified compressive strength of the concrete, f´c, shall be 4500 psi unless otherwise specified. Strength requirements shall be based on 28-day compressive strength unless a different test age is specified.

2.22.3 *Weight*. Unless otherwise specified the concrete shall be normal weight. When lightweight concrete is specified, the concrete proportions shall be selected to meet the specified limit on maximum air-dry unit weight as measured in accordance with ASTM C567.

2.22.4 *Durability*. Concrete shall be air-entrained to meet the requirements of ACI 301, Table 4.2.2.7.b.1, subject to Exposure Class F2 as follows:

Aggregate Size	Percent Air Content by Volume
#7 (½ in. max.)	7
#67 (¾ in. max.)	6
#57 (1 in. max.)	6

Measurement of air content shall conform to ASTM C231.

Note: Concrete for slabs to which a metallic floor hardener is to be applied shall have an air content of two to three percent (by volume)

2.22.5 *Water-Cement Ratio.* Concrete for all structures shall have a water-cementing material ratio (cement plus any accepted pozzolans) not exceeding 0.45 by weight, unless otherwise specified.

2.22.6 *Minimum cement.* Minimum cementing material content (cement plus any accepted cementitious or pozzolan admixtures) per cubic yard for all concrete shall conform to ACI 301, Table 4.2.2.1 as follows, unless otherwise specified:

Nominal Maximum Aggregate Size	Minimum Cement
1 in. (#57 stone)	520 pounds/cubic yard (5.5 Bags/C.Y.)
¾ inch (#67 stone)	540 pounds/cubic yard (5.7 Bags/C.Y)
½ inch (#7 stone)	590 pounds/cubic yard (6.3 Bags/C.Y.)

2.22.7 *Minimum Cement for Hydraulic Structures.* Minimum cementing material content (cement plus any accepted pozzolans) per cubic yard for hydraulic structures shall conform to ACI 350, Table 4.1.2.1 as follows, unless otherwise specified:

Nominal Maximum Aggregate Size	Minimum Cement
1 in. (#57 stone)	535 pounds/cubic yard (5.7 Bags/C.Y.)
¾ inch (#67 stone)	560 pounds/cubic yard (6.0 Bags/C.Y)
½ inch (#7 stone)	580 pounds/cubic yard (6.2 Bags/C.Y.)

2.22.8 *Slump.*

- All concrete (except floor slabs) with specified f´c of 4500 psi or greater shall be proportioned and produced to have at the point of delivery a slump of four inches. Concrete for floor slabs with specified f´c of 4500 psi or greater shall be proportioned and produced to have a slump of three inches or less. The slump shall be determined in accordance with ASTM C143. Slump tolerance shall meet the requirements of ACI 117.
- When use of an accepted plasticizing admixture conforming to ASTM C1017 or when a Type F or G high range water reducing admixture conforming to ASTM C494 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added.

2.22.9 *Maximum Size of Coarse Aggregate.* Maximum size of coarse aggregate shall not be more than #57 stone (one inch), one-fifth of the narrowest width of beams or walls, one-third of the depth of slabs, nor three-quarters of the minimum clear spacing between reinforcing bars. Additionally, the maximum size of coarse aggregate shall not be less than #7 stone (one-half inch).

Note: To minimize shrinkage, the use of concrete with #7 stone maximum aggregate should be restricted to situations where the use of small aggregate is required, such as concrete placements into narrow forms congested with reinforcement.

2.22.10 *Selection of Proportions.* Each concrete design mix shall be proportioned in accordance with ACI 301, Section 4.2.3 on the basis of previous field experience or laboratory trial mixtures.

2.22.11 *Proportioning on the Basis of Previous Field Experience or Trial Mixtures.*

- The determination of the standard deviation and the required average compressive strength shall be in accordance with ACI 301, Section 4.2.3.

  Note: ACI 301 stipulates that, when the data required to compute the standard deviation is not available, the required average strength (such as determined by trial mixtures) shall not be less than f´c + 1200 psi, for f´c, between 3000 and 5000 psi.

- The documentation of the average compressive strength shall be in accordance with ACI 301, Section 4.2.3.4.

2.22.12 *Proportioning Based on Empirical Data*. Concrete shall not be proportioned based on empirical data.

2.22.13 *Reduction of the Required Average Strength.* After sufficient data becomes available during construction, the amount by which the average strength must exceed the specified minimum strength f'c may be reduced, subject to approval by the Engineer, in accordance with ACI 301, Section 4.2.3.6.

2.22.14 *Lightweight Concrete.* The ability of the selected proportions to meet the specified limits for air-dry weight shall be verified by tests made in accordance with ASTM C567. The air-dry unit weight shall be correlated with the fresh unit weight of the same concrete to permit use of the latter as the basis for acceptance during construction.

2.22.15 *Hydraulic Structure Water Permeability.* The permeability of trial batch concrete proposed for use in any watertight structure indicated on the Drawings shall not exceed 10 times 10 to the minus 12 when tested in accordance with CRD-C 48, Standard Test Method for Water Permeability of Concrete.

3.0 EXECUTION

3.1 FORMWORK

3.1.1 The design and installation of all formwork and formwork accessories shall be in accordance with ACI 301, Section 2, except as otherwise specified.

3.1.2 Chamfer strips, ¾ inch by 45 degrees in size, shall be used at all edges of formed concrete to be left exposed, unless otherwise specified.

3.1.3 *Tolerances*. Unless otherwise specified, formwork shall be constructed so that the concrete surfaces will conform to the tolerances given in ACI 117. Formed surface irregularities (gradual or abrupt) shall conform to Class C Surface in accordance with ACI 117, unless otherwise specified.

3.1.4 The portion of the forms in contact with concrete surfaces to receive joint sealer shall be free of any substance which will remain on these surfaces and cause the adhesion between the surfaces and the sealer to be weakened.

3.1.5 Form tie assemblies for hydraulic structures shall be of such type as to leave no metal or other material within 1½ inches of the surface. The assembly shall provide a cone-shaped depression at the surface of the concrete at least one inch in diameter and 1½ inches deep to allow filling and patching.

3.1.6 When a portion of single rod ties are to remain in a liquid retaining structure, the portion that is to remain shall be provided with a tightly fitted washer at midpoint.

3.2 REINFORCEMENT

3.2.1 The fabrication of reinforcing steel shall conform to the requirements of ACI 301, Section 3.2.2. All reinforcement shall be cold bent unless otherwise specified.

Note: Fabrication shall not be started until the reinforcing steel shop drawings have been reviewed and marked "Released for Production" by the Engineer.

3.2.2 Reinforcing shall not be welded unless otherwise specified. When welding of reinforcement is specified all such welding shall conform to AWS D1.4.

3.2.3 Where welding is specified for zinc-coated or epoxy-coated reinforcement, zinc coatings shall be repaired afterwards with a zinc-rich formulation conforming to ASTM A767 and epoxy coatings shall be repaired with a patching material conforming to ASTM A775. Such repairs shall conform to the material manufacturer's recommendations. All welds, and all steel splice members used to splice reinforcing bars, shall be coated with the material used for repair of coating damage.

3.2.4 Tolerances for the fabrication of reinforcing steel shall conform to ACI 117, Section 2.1.

3.2.5 Tolerances for the placing of reinforcing steel shall conform to the requirements of ACI 117, Section 2.2.

3.2.6 Reinforcement shall be accurately placed and adequately supported before the concrete is placed, secured against displacement in accordance with the permitted tolerances, and shall conform to the requirements of ACI 301, Section 3.3.

3.2.7 Welded wire reinforcement shall be accurately placed and supported to maintain positioning in the slab during concrete placement. Do not place welded wire reinforcement on grade and subsequently raise into position during placement of concrete.

3.2.8 Slab on grade dowels shall be saw-cut, not sheared. Remove all burrs.

3.2.9 Slab on grade dowels shall be secured perpendicular to the joint and parallel to the finished concrete surface. Use prefabricated dowel supports (dowel basket assembly) at ends of dowels to maintain alignment, unless otherwise allowed by the Owner's Representative. Cut prefabricated dowel supports as required to allow adjacent slab panels to move longitudinally. Ensure dowel misalignment does not exceed specified tolerances given in ACI 117, Section 2.2.10. Ensure dowels are not installed closer than 12 inches from the corner of any slab panel.

3.3 CONSTRUCTION AND CONTROL JOINTS

3.3.1 Construction joints, when necessary, shall be located as near as possible to the quarter points of the spans of slabs, beams, and girders as approved by the Engineer. Joints, when necessary, in columns and walls shall be at the underside of beams and girders, and at the top of footings. Beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as slabs.

3.3.2 In slabs on grade, unless otherwise indicated on the Drawings, provide construction or control joints continuously at a maximum spacing (in feet) of two to three times the slab thickness (in inches) with length-to-width ratio less than 2:1, into a grid pattern which coincides with column center lines whenever feasible, and as approved by the Owner's Representative. (For example: maximum joint spacing for a 6 inch slab should be 3 x 6 = 18 feet).

3.3.3 Control joints shall be completed while the concrete is still in the plastic state. Saw cut control joints as soon as concrete has hardened sufficiently to prevent raveling or dislodgement of coarse aggregate particles and within 12 hours of concrete placement.

3.3.4 Do not extend reinforcement, corner protection angles or other fixed metal items through construction or control joints in slabs on grade or walls, or through joints between slabs on grade and vertical surfaces, unless otherwise noted on the Drawings.

3.4 EXPANSION AND ISOLATION JOINTS

3.4.1 Reinforcement or other embedded metal items bonded to the concrete, except dowels in slabs on grade, bonded on only one side of the joint, shall not be permitted to extend through any expansion joint.

3.4.2 Provide ½-inch wide joints continuously at edges of slabs on grade abutting walls, columns, foundations and other construction, unless otherwise indicated. Joint filler

material shall be securely positioned and extend the full depth of the joint with space at the top for joint sealer.

3.4.3 Exposed corners with rough edges shall be smoothed with an abrasive tool prior to joint sealer installation. Concrete surfaces to receive joint sealer shall be clean and dry prior to sealer installation.

3.5 WATERSTOPS

3.5.1 Waterstops shall be placed at the locations shown on the Drawings with the layout designed to provide a continuous water tight barrier.

3.5.2 Each piece of premolded waterstop shall be of the maximum practical length to reduce the number of required splices.

3.5.3 Premolded waterstop material shall be fused at all joints to form a continuous barrier. Joints shall develop water tightness equal to that of continuous waterstop material, shall permanently develop not less than 50 percent of the mechanical strength of the parent section, and shall permanently retain their flexibility.

3.6 OTHER EMBEDDED ITEMS

3.6.1 All Contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to set and/or furnish embedded items before the concrete is placed.

3.6.2 *Embedded Items.* All embedded items and anchor bolts set in any section or area where concrete is scheduled to be placed shall be set true to the positions shown to within $^{1}/_{8}$ inch or to closer tolerances as otherwise indicated on the Drawings. Embedded items and anchor bolts shall be free of oil and other foreign matter, securely installed, and thoroughly checked for placement accuracy by the Contractor before concrete placement is started for that section or area. Voids to be filled with other materials as part of the embedded item shall be temporarily filled with readily removable material to prevent the entry of concrete into these voids.

3.7 PRODUCTION OF CONCRETE

The production of all concrete shall conform to the requirements of ACI 301, Section 4.3. Plant equipment and facilities shall conform to “Certification of Ready Mixed Concrete Production Facilities” by the National Ready Mixed Concrete Association. Ready-mixed concrete shall be batched, mixed and transported in accordance with ASTM C94, except as otherwise specified. Discharge of concrete shall be completed within 1½ hours or 300 drum revolutions, whichever comes first after batching into the concrete drum.

3.8 TEMPERING AND CONTROL OF MIXING WATER

3.8.1 Concrete shall be mixed only in quantities for immediate use. Concrete which has started to harden shall be discarded and shall not be retempered.

3.8.2 When concrete arrives at the jobsite with a slump below the specified slump at the point of placement and is unsuitable for placing at that slump, water may be added only as approved by the concrete supplier and the Owner's Representative as follows:

a) Additional water may be added provided the design mix water-cement ratio nor the maximum slump for the concrete mix is exceeded. Additional water may be permitted provided the water-cement ratio is maintained by the addition of cement in sufficient quantities to maintain the proper water-cement ratio.

b) Additional water shall be added only once and incorporated into the mixture by mixing for a minimum additional 30 drum revolutions in accordance with ASTM C94. Immediately after such additional mixing, representative samples shall be taken for separate strength tests.

c) Water shall not be added to concrete after plasticizing or high-range water reducing admixtures have been added to the concrete at the site.

3.9 EXTREME WEATHER CONDITIONS

3.9.1 *Hot Weather:* The temperature of the concrete as delivered shall not exceed 95°F. Loss of slump, flash set, or cold joints due to temperature of concrete as placed shall not be acceptable.

3.9.2 *Cold Weather:* When the average of the highest and lowest ambient temperature during the period midnight to midnight is expected to be less than 40°F for more than three consecutive days, concrete shall be delivered to meet the following minimum temperatures immediately after being placed:

Least Dimension of Section	Minimum Temperature
less than 12”	55°F
12” to 36”	50°F
36” to 72”	45°F
greater than 72”	40°F

The temperature of concrete as placed shall not be less than these minimum values by more than 20ºF. Minimum temperature requirements may be terminated when temperatures above 50ºF occur for more than half of any 24-hour duration.

3.10 PREPARATION BEFORE PLACING CONCRETE

3.10.1 General. Immediately prior to concreting, the place of deposit and all mixing, transporting, conveying and placing equipment shall be available for inspection. The Contractor shall give the Owner's Representative 24 hours notice before placing concrete.

3.10.2 The inner surfaces of conveying equipment shall be free of hardened concrete and foreign materials.

3.10.3 Previously cast construction joints shall be prepared as follows:

a) Concrete surfaces shall be free of all laitance, soft mortar, dirt, form oil and other foreign materials.

b) Concrete surfaces shall be moistened thoroughly to be damp but completely free of standing water or free moisture and roughened to 1/4 inch amplitude.

c) Surfaces of all vertical construction joints cast against bulkheads shall be roughened to uniformly expose the aggregate, and then washed with clean water to remove all dust and loose particles.

d) Surfaces of all horizontal construction joints in the work designed to contain liquids (such as chests) shall be dampened, but not saturated, and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. Concrete shall be placed before the grout has attained its initial set.

e) Surfaces specified to receive an adhesive shall be prepared and the adhesive applied in accordance with the manufacturer's recommendations.

3.10.4 Formwork shall be completed; snow, ice and water shall be removed; reinforcement shall be secured in place; and expansion joint materials, anchor bolts, and other embedded items shall be properly positioned.

3.10.5 Reinforcement shall be free of dirt, loose scale, oil, ice, kinks or bends not shown on the details or Drawings, and free of rust capable of removal by moderate handwiping.

3.10.6 *Preventing Cave-Ins.* Adequate means of preventing cave-ins of earth during placing of concrete shall be provided. All work shall conform to OSHA Standards.

3.10.7 *Preventing Absorption of Water.* Earth, against which concrete is to be placed, shall be sufficiently damp to prevent absorption of water from the concrete, without allowing water to stand.

3.10.8 Grade under slabs shall conform to line and grade of the slab bottom as indicated on the Drawings.

3.10.9 Concrete shall not be placed on frozen ground.

3.10.10 The readiness of each place to receive concrete shall be approved by the Owner's Representative before concrete placement.

3.11 PLACEMENT OF CONCRETE

3.11.1 *General*. Placement of concrete shall be in accordance with ACI 301, Section 5.3.2 and the following additional requirements:

3.11.2 Concrete shall be conveyed and deposited in such manner as to prevent separation of ingredients and to minimize rehandling and flowing. In depositing concrete, the following requirements shall be observed:

a) For free-fall heights of six feet or less, concrete may be deposited without the use of a dropchute if apparent separation of ingredients does not occur.

b) For free-fall heights greater than six feet, a dropchute shall be used.

c) For hydraulic structures the free-fall height shall not exceed four feet.

3.11.3 Where concrete is placed against earth, care shall be taken to prevent mixing of earth and concrete during placing and consolidation.

3.11.4 Concrete shall be properly consolidated at or near the place of deposit. Thickness of deposited concrete layers shall not exceed 18 inches. The vibrator shall not be used to move the concrete to other parts of the form. Adequate reserve vibration equipment shall be on hand to insure continuous consolidation of all freshly placed concrete.

3.11.5 All concrete surfaces to receive grout, or an additional concrete pour, shall be roughened with a rake or coarse broom before the fresh concrete obtains final set.

3.11.6 Concrete shall not be deposited under water, unless otherwise specified. Where such placement is specified, procedures for placing concrete shall ensure the concrete enters the mass of previously placed concrete where the concrete displaces water with minimum disturbance at the concrete/water interface. Placing procedures and the concrete mix design shall be approved by the Owner's Representative.

3.12 CURING AND PROTECTION

3.12.1 Concrete shall be cured and protected immediately after placement in accordance with ACI 301, Section 5.3.6 and as follows:

Note: Curing compound shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proven that the curing compound will not prevent bond.

3.12.2 Concrete surfaces to receive joint sealer shall be kept free of any substance which might cause the adhesion between these surfaces and the joint sealer to be weakened.

3.12.3 After concrete has been placed, anchor bolts shall be protected from corrosion by daubing the threads with grease, wrapping with burlap, and then covering bolts with wooden boxes or plastic protectors. All grout pockets, anchor bolt sleeves and other areas vulnerable to the collection of water and debris shall be suitably protected at all times to prevent damage to concrete or embedments from freezing water or contact with deleterious materials until such time as these voids are grouted and the installation completed.

3.12.4 Contractor shall provide additional attention to water curing requirements and keep each surface wet for concrete slabs exposed to direct sunlight throughout the curing period especially on any day when the surface temperature reaches 80°F.

3.12.5 Curing of floor hardened surfaces shall be in accordance with the recommendations of the floor hardener manufacturer.

3.12.6 Housing, covering or other protection used to maintain elevated temperature shall remain in place for at least 24 hours after artificial heating is discontinued.

Note: ACI 301 stipulates that concrete shall be cured for seven days after placement except for high-early-strength concrete for which the minimum period is three days. Alternately, ACI 301 permits terminating proper moisture retention measures when properly field-cured cylinders reach 70 percent of f'c, or when laboratory-cured cylinders reach 85 percent of f'c provided the temperature of the in-place concrete has been maintained at 50°F or higher during curing.

3.12.7 Maintain concrete protection to prevent freezing of the concrete and to ensure necessary strength development for structural safety. Remove protection so that the maximum decrease in temperature measured at the concrete surface in a 24 hour period shall not exceed the following:

Least Dimension of Section	***Maximum Surface Temperature Change***
less than 12"	*50°F*
12" to 36"	*40°F*
36" to 72"	*30°F*
greater than 72"	*20°F*

When the concrete surface temperature is within 20°F of the ambient or surrounding temperature, protective measures may be discontinued.

3.13 REMOVAL OF FORMS AND RESHORING

3.13.1 The removal of forms and reshoring shall conform to ACI 301, Section 2.3.2 and the following additional requirements:

3.13.2 Forms and shoring supporting the weight of floor slabs shall remain in place until the concrete attains at least 50 percent of the specified compressive strength (f´c) but not less than 2000 psi, unless otherwise specified.

3.13.3 Forms and shoring supporting the weight of concrete other than slabs shall remain in place until the concrete attains at least 75 percent of the specified compressive strength (f´c), unless otherwise specified.

3.13.4 Construction loads shall not exceed 50 percent of the design live load until the specified compressive strength is attained unless shoring is designed and installed to carry the total load, unless otherwise specified.

3.13.5 For the purpose of determining when form removal is allowed, the concrete will be presumed to have reached the specified strength when either of the following conditions has been met:

a) When field cured test cylinders representing the concrete where form removal is planned have reached the strength specified for form removal.

b) When the concrete has been cured in accordance with these specifications for the same length of time as the age for the testing of laboratory-cured cylinders which have reached the strength specified for form removal. The length of time the concrete in the structure has cured shall be taken to be the cumulative time when the concrete has been dampened or thoroughly sealed against moisture loss and the temperature has been above 50°F.

3.13.6 Forms to be reused shall be cleaned immediately after removal.

3.14 REPAIR OF SURFACE DEFECTS

Repair all tie holes and all surface defects immediately after form removal in accordance with ACI 301, Section 5.3.7, except as otherwise specified.

3.15 FINISHING OF FORMED SURFACES

3.15.1 Formed surfaces of exposed concrete shall have all concrete fins removed and patching performed immediately after removal of forms with surfaces rubbed to remove loosened surface particles, to provide a uniform surface texture and to reduce misalignment of adjacent forms to not over 1/16 inch in subsequent pours.

3.15.2 Formed surfaces of unexposed concrete shall be patched as needed immediately after removal of forms and typically do not require further work, unless specified by the Owner's Representative.

3.16 FINISHING OF UNFORMED (TOP) SURFACES

3.16.1 Unformed top surfaces of concrete shown on plans as level or as sloping planes shall be finished to a "straightedged" finishing tolerance as determined by placing a 10 foot straightedge anywhere on the slab and allowing it to rest upon two high spots within 72 hours after concrete placement, unless otherwise indicated. The gap at any point between the straightedge and the concrete shall not exceed $^{5}/_{16}$ inch.

3.16.2 Any depressed surface shall be struck off to elevations noted on plans.

3.16.3 Floor finishes shall be provided depending upon the use to which the surface will be subjected as follows, unless otherwise indicated on the Drawings.

a) Float Finish. Provide an even, level, dense surface by mechanical and/or hand floating to establish finished grades. See ACI 301, Section 5.3.4.2.b.

Note: This finish is for roof slabs, interior floor slabs to receive tile or other covering and concealed surfaces such as tops of footings and grade beams below slabs or below ground level.

b) Soft-Textured Broom Finish. The surface shall be thoroughly hand or mechanically floated as required for Float Finish. Following any trowelling required to meet the specified finishing tolerance, the surface shall be lightly brushed with a soft bristled broom to produce a uniform, slightly textured surface, with grooves at right angles to the direction of greater traffic.

Note: This finish is for slightly sloped interior floor slabs in areas containing operating equipment.

c) Rough-Textured Broom Finish. The surface shall be thoroughly hand or mechanically floated as required for Float Finish. Following any trowelling required to meet specified finishing tolerance, the surface shall be lightly brushed with a coarse bristled broom to produce a uniform roughly textured surface, with grooves at right angles to the direction of greater traffic.

Note: This finish is for exterior concrete exposed surfaces and all interior floor slabs in continuously wet operating areas.

d) Trowel Finish. After thorough hand or mechanical floating, when no additional mortar or moisture can be drawn to the surface, and when the concrete is sufficiently hardened to bear a man's weight without imprint, the surface shall be steel trowelled smooth. Final trowelling by hand shall produce a ringing sound when the trowel is drawn across the surface. This requires a "Flat" finishing tolerance (maximum 3/16 inch gap between the 10 foot straightedge and the concrete).

Note: This finish is for electrical room floor slabs, operator control room floor slabs, interior floor slabs which do not contain operating equipment and tops of curbs and walls.

3.17 METALLIC FLOOR HARDENER APPLICATION

When application of a metallic floor hardener is specified on the Drawings, the hardener material shall be applied to a float finished surface at the rate recommended by the manufacturer for the particular type of service to which the floor will be subjected, in accordance with procedures demonstrated in the preparation of a Floor Slab Test Panel. The finish shall match the texture and density of the Floor Slab Test Panel finish selected by the Owner's Representative as the model for this work.

3.18 JOINT SEALING AND FILLING

3.18.1 *General.* Fill control and construction joints in floor slabs with sealant or filler where indicated on the Drawings. Use elastomeric joint sealant in control and construction joints subject to pneumatic tires and light traffic loading, unless otherwise specified. Use semi-rigid epoxy or polyurea joint filler for control and construction joints subject to small, hard-wheeled traffic, like solid rubber, hard urethane, nylon casters or steel-wheeled traffic. Isolation joints shall be sealed with an elastomeric joint sealant.

3.18.2 *Cleaning.* Immediately prior to sealing or filling, clean joints to full depth of saw-cut in accordance with manufacturer's recommendations. Remove all form release agent, curing compound or other contaminants.

3.18.3 *General Installation.* Commence placing joint sealant/filler when all construction is nearing completion, but in no case sooner than 90 days after concrete is placed. Delay sealing/filling operations until the facility's environmental systems have been placed in operation for 14 days. Install in accordance with manufacturer's recommendations. Use a primer if recommended for the specific application. Install tape on both sides of joints to assure no spill-over on sides of joints. When tape is removed, ensure entire joint has

been filled. Completely fill joints. Remove excess sealant/filler prior to setting. Add extra sealant/filler prior to setting if needed to prevent depressed areas. Provide cured sealant/filler flush with finished concrete surface.

3.18.4 *Elastomeric Joint Sealant Installation.* Use joint back-up material.

3.18.5 *Epoxy or Polyurea Joint Filler Installation.* Do not use joint back-up material. However, use ¼ inch maximum of sand at the bottom of the joint to prevent loss of filler and bonding to bottom of the joint.

3.19 ARCHITECTURAL CONCRETE

All concrete designated as architectural concrete on the Drawings or elsewhere in the contract documents shall conform to the requirements of ACI 301, Section 6 for architectural concrete.

3.20 MASS CONCRETE

All concrete with a least dimension greater than six feet, or when designated on the Drawings, shall be treated as mass concrete and the requirements of ACI 301, Section 8 for mass concrete shall be satisfied. Refer to ACI 207.1R for references and general information on mass concrete. Refer to the notes on the Drawings for additional specific mass concrete requirements.

3.21 PRECAST-PRESTRESSED CONCRETE

Precast - Prestressed concrete shall be in accordance with SECTION 033400, Precast-Prestressed Concrete of the Construction Specifications.

3.22 JOB-CAST, POST-TENSIONED, PRESTRESSED CONCRETE

Job-cast, post-tensioned, prestressed concrete shall conform to the special provisions of ACI 301, Section 9, in addition to all other applicable portions of this specification.

3.23 QUALITY ASSURANCE

General. Quality assurance shall be in accordance with ACI 301, Section 1.6, unless specified otherwise, and as follows:

3.23.1 Concrete testing procedures, except as otherwise provided, shall be as follows:

a) Determining Air Content. ASTM C173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method, or other suitable method approved by the Owner's Representative.

b) Determining Slump. ASTM C143, Standard Test Method for Slump of Hydraulic Cement Concrete.

c) Making, Curing and Shipment of Test Specimens. ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field, with special attention to consolidation, prevention of water evaporation, temperature control and handling.

d) Compression Testing of Strength Test Specimens. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

3.23.2 Concrete testing shall be performed as follows:

a) By the Contractor. Representative samples for an air test, a slump test and a strength test from four molded test cylinders shall be taken not less than once each day of concrete placement and for each 100 cubic yards of concrete placed for each design mix. Additional cylinders required to permit early stripping of forms or early application of working loads on the concrete shall also be prepared by the Contractor. Air test and slump test shall be made in the field and the results recorded. After proper field handling and curing, the cylinders shall be carefully transported to the testing laboratory in time for scheduled testing. The persons who do this work shall be ACI Concrete Field Testing Technicians, Grade 1, or accepted equivalent.

b) By the Testing Laboratory. Minimum compression testing for each Strength Test shall be one cylinder at seven days and two cylinders at 28 days. If the 28 day test fails, the fourth cylinder shall be tested at 60 days. Additional cylinders required to permit early stripping of forms or early application of working loads on the concrete (see Paragraph 3.13), shall also be compression-tested by the testing laboratory.

3.23.3 *Unused Concrete.* Concrete in samples removed from the concrete trucks for testing purposes shall be wasted on the site as directed by the Owner's Representative.

3.24 EVALUATION AND ACCEPTANCE OF CONCRETE STRENGTH AND STRUCTURE

The evaluation of test results, acceptance of concrete and core tests where required and acceptance of the structure shall be in accordance with ACI 301, Sections 1.6.5, 1.6.6, 1.6.7 and 1.7 and the contract documents.

3.25 SPECIAL INSPECTION

The required verification and inspection of concrete construction shall be in accordance with the International Building Code, Section 1704 "Special Inspections and Tests, Contractor Responsibility and Structural Observation" and Section 1705 "Required Special Inspections and Tests", and Table 1705.3.

In addition, refer to SECTION 014533, Structural Inspections and Tests, of the Construction Specifications.

END OF SECTION

CONSTRUCTION SPECIFICATION

wood.

TITLE:	GROUT	PROJECT DOC. NO.:	143993-ASA-DD2-SPC-1303	REV.	0

PROJECT NAME:	D.B. Wilson Station FGD Retrofit Project	PROJECT NO.:	245891
CLIENT:	Big River Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	DRF	DATE	10FEB21	CHECKED BY:	SCK	DATE	23FEB21
APPROVED BY:	JDW	DATE	12FEB21	APPROVED BY:	CLF	DATE	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 036000

GROUT

1.0 GENERAL

1.1 SCOPE

This Section includes all material, labor, equipment and services required to install all grout for equipment base plates, sole plates, slide plates, column base plates and other bearing plates in accordance with the Drawings, Construction Specifications and Scope of Work Document.

Where there is a discrepancy between the Drawings and this Specification, the Drawings shall take precedence.

1.2 PUBLICATIONS REFERENCED HEREIN (Latest edition unless noted)

- American Society for Testing and Materials (ASTM), Standards as indicated
- American Association of State Highway and Transportation Officials, AASHTO T260, *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials*
- American Concrete Institute: ACI Committee 116, *Cement and Concrete Terminology*

1.3 DEFINITIONS

1.3.1 Contractor. Company, partnership or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and the contract documents.

1.3.2 Owner. Big River Electric Corporation.

1.3.3 Owner's Representative. The authorized representative of the Owner.

1.3.4 Engineer. Wood, doing business as AMEC Foster Wheeler Industrial Power Company, Inc.

1.3.5 Acceptance. No substitutions will be considered unless specifically requested in writing with reasons for the substitution and supporting technical data. Acceptance shall be by the Engineer for all materials and methods.

1.3.6 Sand-Cement Grout. Job mixed sand-cement or premixed non-shrink, natural aggregate proprietary Portland cement-based grout.

1.3.7 Precision Grout. Premixed, high precision, flowable/fluid non-shrink, natural aggregate, proprietary Portland cement-based grout.

1.3.8 Epoxy Grout. Three component proprietary chemical grout consisting of a resin, hardener and aggregate.

1.3.9 Testing Laboratory. An independent engineering testing laboratory engaged by the Contractor, or as otherwise specified in the contract documents, to perform testing services required in this Section not otherwise assigned.

1.3.10 Owner's Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform evaluation and testing services specified in this Section.

1.3.11 Definitions of other terms used in this Section and not defined herein or elsewhere in the contract documents shall be as defined by ACI Committee 116.

1.4 SUBMITTALS

1.4.1 Independent certified test reports showing compliance with this specification and a list of similar projects where proposed grouts and any alternately proposed grouts have been previously used shall be submitted to the Engineer. The reports shall include the following:

1.4.1.1 Results of flow consistency tests conducted immediately after the mixing of a test grout batch, and at least 30 minutes later on grout from that same batch at both a low temperature of not less than 45°F and at a high temperature of not greater than 90°F in accordance with ASTM C1107.

1.4.1.2 Results of height change and strength tests conducted on specimens cast immediately after the mixing of a test grout batch, and on specimens cast at least 30 minutes later from same batch at both a low temperature of not less than 45°F and a high temperature of not greater than 90°F in accordance with ASTM C1107.

1.4.1.3 Certification that chlorides have not been added to the grout mixture. The water soluble chloride ion concentration in the hardened grout shall not exceed 0.10% by weight of the cement when tested in accordance with AASHTO T260 or ASTM C1218.

1.4.2 All grouts proposed to be used on the project including any alternate grouts shall not be used until evaluated by the Owner's Testing Laboratory to ensure that the grout supplied to the project has been manufactured to the same quality standards as the grout on which the certified tests were conducted.

1.4.3 The Owner's Testing Laboratory shall evaluate and submit reports to the Engineer on all cement-based grouts as follows:

1.4.3.1 Five bags of cement-based grout representative of the grout(s) proposed for use on the project shall be furnished by the Contractor to the Owner's Testing Laboratory from the same supply source that the grout(s) for the project will be obtained.

1.4.3.2 The Owner's Testing Laboratory shall perform the following observations and tests on cement-based grouts to evaluate compliance with this specification as follows:

a) Product packaging shall be marked in accordance with ASTM C1107 including instructions either marked or attached as specified herein.

b) There are no discrepancies between the product markings and the requirements of this specification.

c) All bag weights are within 2% of the nominal weight.

d) Grouts mixed at 45°F and 90°F to a flowable/fluid consistency in accordance with the manufacturer's written instructions and temperatures held constant at 45°F and 90°F with mixed product placed in a pail covered to prevent evaporation and set in chilled/heated water to maintain mix temperature shall:

- Remain at a flowable/fluid consistency for a minimum of 30 minutes.
- Not show signs of any visible bleed water collecting on the surface.
- Provide a minimum of 1000 psi compressive strength on 2 inch cube specimens tested at 24 hours in accordance with ASTM C109.

1.4.4 The Owner's Testing Laboratory shall evaluate and submit reports to the Engineer on all epoxy grouts as follows:

1.4.4.1 Three standard units of the three components of epoxy grout representative of the epoxy grout proposed for use in the project shall be furnished by the Contractor to the Owner's Testing Laboratory from the same supply source that the grout for the project will be obtained.

1.4.4.2 The Owner's Testing Laboratory shall perform the following observations and tests on epoxy grouts to evaluate compliance with this specification as follows:

a) Product packaging shall be marked and include instructions either marked or attached to the packaging as specified herein.

b) There are no discrepancies between the product markings and the requirements of this specification.

c) Component unit weights are within 2% of the nominal weight.

d) Epoxy grouts mixed at 60°F and 90°F in accordance with the manufacturer's written instructions and placed in a pail holding the grout in chilled/heated water during the test to maintain the mix temperature shall:

- Remain fluid with a self-leveling consistency for a minimum of 30 minutes.
- Provide a minimum of 2000 psi compressive strength on 2 inch cube specimens tested at 24 hours with grout mixed and cured at 60°F in accordance with ASTM C579 (Method B).

1.4.5 Grout Manufacturer's Technical Representative Service Report shall be submitted to the Contractor, Owner and Engineer as specified in this Section.

1.4.6 Production testing shall be the responsibility of the Contractor and all test reports shall be submitted to the Owner and Engineer as specified in this Section.

1.5 COORDINATION BETWEEN DRAWINGS AND SPECIFICATIONS

Grout shall be provided as specified in the Grout Schedule included at the end of this Section, unless otherwise noted on the Drawings. Grouting instructions shown on the Drawings shall govern over this specification.

1.6 DELIVERY CONDITION

1.6.1 Cement, premixed sand-cement grout, precision grout, and epoxy grout aggregates shall be delivered to the Contractor in sound dry bags. Epoxy grout liquid components shall be delivered in sealed containers. The Contractor shall be responsible for storing materials in a dry, weatherproof area and maintain this area within the temperature range specified by the manufacturer(s).

1.6.2 Any material which becomes damp or otherwise defective shall be immediately removed from the site by the Contractor at his own expense.

1.6.3 The total job storage time for grout materials shall be limited to 10 months or the manufacturer's recommended maximum storage duration whichever is shorter.

2.0 **PRODUCTS**

2.1 PORTLAND CEMENT

Cement shall be Portland cement conforming to ASTM C150, Type I, II or III, and shall be of one brand produced at a single cement manufacturing plant.

2.2 WATER

Mixing water shall be suitable for drinking.

2.3 JOB MIXED SAND-CEMENT GROUT

2.3.1 Job mixed sand-cement grout shall consist of Portland cement, fine aggregate, and for Class "B" Grout $^{3}/_{8}$ inch coarse aggregate. Job mixed sand-cement grout shall be proportioned by volume according to class as follows:

Class	Proportion	Thickness Range
“A”	1 Part – Portland Cement 2.5 Parts – Fine Aggregate	2 inches or less
“B”	1 Part – Portland Cement 2.5 Parts – Fine Aggregate 2.5 Parts – Coarse Aggregate	Over 2 inches

2.3.2 Sand-cement grout may be a premixed non-shrink proprietary grout mixed according to the manufacturer’s written instructions to provide the required consistency.

2.3.3 Sand-cement grout shall be used for dry-packing only and only when there is at least one inch of clearance under the base plate, unless specifically noted on the Drawings. Base plates with less than 1 inch clearance shall be grouted with a premixed, non-shrink proprietary gout with a flowable consistency.

2.3.4 Dry-packed sand-cement grouts shall have only sufficient water to form a ball when squeezed in the "fist" of a hand and shall not change shape by "crumbling" or "flowing" when the "fist" is opened. The water-cement ratio shall not be less than 0.23 by weight.

2.3.5 Fine aggregate shall conform to ASTM C33, concrete sand.

2.3.6 Coarse aggregate shall conform to ASTM C33, size No. 8 ($^{3}/_{8}$ inch maximum nominal size).

2.3.7 Precision grouts listed in this specification may be used as a sand-cement grout.

2.3.8 Compressive strength of sand-cement grouts shall be a minimum of 2,000 psi in seven days, and 4,000 psi in 28 days.

2.3.9 Premixed construction grade grout meeting these requirements may be used as sand-cement grout.

2.4. PRECISION GROUT

2.4.1 Non-shrink cement-based proprietary grout shall conform to ASTM C1107 and shall satisfy the following requirements when mixed and cured at all temperatures between 45°F and 90°F in accordance with this specification and the manufacturer's recommendations:

2.4.1.1 Grout shall be non-corrosive, free of chlorides, and suitable for use in industrial environments.

2.4.1.2 Grout shall be suitable for placing at a flowable consistency as defined by ASTM C1437 or at a fluid consistency as defined by ASTM C939, and when mixed to such a consistency shall remain at that consistency for a minimum of 30 minutes for all temperatures between 45°F and 90°F.

2.4.1.3 Grout shall exhibit no shrinkage, a maximum of 4.0% early height change, and a maximum of 0.3% expansion at 28 days age when tested in accordance with ASTM C1107.

2.4.1.4 Grout when mixed with the maximum amount of water permitted by the manufacturer’s recommendations shall achieve the following minimum compressive strength when tested in accordance with ASTM C109:

Strength	Age
1000 psi	1 day
2500 psi	3 days
4000 psi	7 days
6000 psi	28 days

2.4.1.5 Grout shall not foam or bleed when mixed with the maximum amount of water permitted by the manufacturer's recommendations.

2.4.1.6 All grout packaging shall clearly show the following in accordance with ASTM C1107:

- Brand name and grade
- Date of manufacturer and recommended expiration date
- Lot identification number

2.4.1.7 The following information shall either be shown on the packaging or attached to the packaging:

- Surface preparation, mixing, placing, and curing instructions
- Maximum amount of mixing water or maximum recommended consistency
- Unit weight or yield
- Maximum working time that grout retains required properties
- High and low preparation and placement temperatures

2.4.2 Non-shrink cement-based proprietary grout shall be selected from one of the following:

Grout Name	Manufacturer
"Five Star Grout"	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484
"MasterFlow 928" Fluid	BASF Construction Chemicals, LLC 889 Valley Park Drive Shakopee, MN 55379
"MasterFlow 555" Flowable	BASF Construction Chemicals, LLC 889 Valley Park Drive Shakopee, MN 55379

2.4.3 Only those grouts listed above and which meet the requirements of this Section shall be used.

2.5 EPOXY GROUTS

2.5.1 Epoxy grout shall satisfy the following requirements when mixed in accordance with the manufacturer's written instructions as furnished with each unit of grout:

2.5.1.1 Epoxy grout shall be suitable for supporting precision machinery subjected to high impact and shock loadings in industrial environments while exposed to elevated temperatures as high as 150°F. For temperatures above 150°F but not exceeding 1000°F use MasterFlow 4316 by BASF.

2.5.1.2 Epoxy grout including all required aggregates shall be of a self-leveling consistency suitable for flowing under equipment base plates at the grout depths specified herein, into shear key pockets and remain at a self-leveling consistency for a minimum of 30 minutes at all temperatures between 60°F and 90°F.

2.5.1.3 Epoxy grout shall be suitable for placement at one to four inches of thickness in a single pour at all temperatures between 60°F and 90°F.

2.5.1.4 Epoxy grout shall achieve the following minimum properties when tested in accordance with the indicated test method at seven days with a conditioning/curing temperature of 73°F:

Compressive Strength	10,000 psi	ASTM C579, Method B
Tensile Strength	2,000 psi	ASTM C307
Maximum Shrinkage	0.001 inch/inch	ASTM C531
Modulus of Elasticity	$1.5x10^6$ psi	ASTM C580

2.5.1.5 Epoxy grout when mixed and cured at 60°F shall achieve a minimum compressive strength of 2000 psi at 24 hours. Testing shall be in accordance with the procedures of ASTM C579 (Method B) with the test age and temperature so modified.

2.5.2 All epoxy grout packaging shall clearly show the following:

- Brand name
- Date of manufacturing and recommended expiration date
- Lot identification number

2.5.3 The following information shall be shown on the packaging or attached to it:

- Surface preparation, mixing, placing and curing instructions
- Unit weight or yield
- Maximum working time
- High and low temperatures for preparation and placement
- Safety Precautions

2.5.4 Epoxy grout shall be selected from one of the following:

Grout Name	Manufacturer
"Five Star HP Epoxy Grout" "Five Star DP Epoxy Grout"	Five Star Products, Inc. 60 Parrott Drive Shelton, CT 06484
"MasterFlow 648"	BASF Construction Chemicals, LLC 889 Valley Park Drive Shakopee, MN 55379
"Unisorb V100"	Unisorb Installation Technologies P.O. Box 1000 Jackson, MI 49204

2.5.5 Only those grouts listed above and which meet the requirements of this Section shall be used.

3.0 EXECUTION

3.1 GENERAL

All grout shall be mixed and installed as specified and in accordance with the manufacturer's recommendations.

3.1.1 The Contractor shall ensure that the grout manufacturer(s) provides a technical representative at the site during the initial grout placement, who will instruct and assist the Contractor in the proper techniques and procedures for mixing, placing and curing each type of grout being supplied.

3.1.2 The grout manufacturer's technical representative shall prepare a service report describing the techniques and procedures and information related to the initial grout placement such as type of grout, flow consistency, ambient temperature, mixing apparatus, method of placement, problems associated with the grouting procedures and quantity of water per unit weight of grout for cement-based grouts.

3.1.3 Technical representative's service report shall be submitted to the Contractor, Owner and the Engineer.

3.2 SETTING OF STRUCTURES AND EQUIPMENT

3.2.1 Roughen all concrete surfaces against which grout will be placed, by chipping, sandblasting or other mechanical means to assure bond of grout to concrete. Surfaces to be in contact with grout shall be entirely free of oil, grease, laitance, curing compounds, and other foreign substances.

3.2.2 Shims shall be coated to prevent bonding and located to facilitate removal.

3.2.3 Column base plates, equipment bases and sole plates shall be set, aligned, firmly anchored and thoroughly cleaned before grout is placed.

3.3 ANCHOR BOLTS

3.3.1 Anchor bolts to be grouted in place shall be thoroughly cleaned of all oil, grease and other foreign substances.

3.3.2 Anchor bolt sleeves shall be cleared of excess water and debris and filled with grout, unless specified otherwise on the Drawings.

3.3.3 Grouting of anchor bolts and anchor bolt sleeves shall be completed prior to grouting of the base plates or equipment.

3.4 SURFACE PREPARATION

3.4.1 Concrete surfaces to receive Sand-Cement or Precision grout shall be saturated with water for 24 hours prior to placing grout. Excess surface water shall be removed just prior to grouting.

3.4.2 Concrete surfaces to receive epoxy grout shall be kept completely dry before grouting.

3.5 FORMS

3.5.1 Sand-cement grout shall be dry packed against a back brace.

3.5.2 Precision grout and Epoxy grout shall be placed using containment forms.

3.5.3 Forms shall be built of materials of adequate strength, securely anchored and shored to withstand all forces which occur during placement of grout.

3.5.4 Precision grout forms shall be tight against all surfaces having all joints sealed with tape or other suitable material to make the forms leak-proof. Form oil or heavy wax shall be applied before forms are erected.

3.5.5 Epoxy grout forms shall be watertight with chamfer strips in place where chamfer edge is required. Caulking such as glazier's putty, butyl rubber caulking or "Dux Seal" shall be used on all joints. Forms shall be lined with polyethylene or carefully waxed with two coats of heavy floor or auto wax. Wax applications shall be applied before forms are erected.

3.5.6 Expansion joints in epoxy grout shall be located in accordance with the manufacturer's recommendations, unless otherwise specified.

3.5.7 Forms shall remain in place at least 24 hours or as recommended by the manufacturer.

3.6 PLACEMENT

3.6.1 Grout placement shall proceed in a manner that will assure the filling of all spaces and provide intimate contact of grouting materials with surfaces to be supported. A minimum effective bearing area of 90% within every 10 square inches of the bearing area shall be achieved.

3.6.2 Placement of grout shall be rapid and continuous so as to avoid cold joints under the base plate or equipment base.

3.6.3 *Hydraulic Head Grouting.* When hydraulic head pressure is used, the level of grout in the head-box shall never be below the bottom of the base or below the top of grout holes or finished surface of the grout. The head-box shall be filled to the maximum height and grout worked under the base. This procedure is repeated until the grout rises above the bottom of the base, top of grout holes or finished surface of the grout.

3.6.4 *Pumping Grout.* Pumped grout shall be placed starting from the back form and worked toward the side of the application while the grout completely fills the void with the nozzle always remaining in the grout. Grout shall continue to be pumped until it rises above the bottom of base, top of grout holes or finished surface of the grout.

3.6.5 Grout shall not be vibrated unless it can be shown that bleeding will not occur.

3.6.6 Shims shall be removed after grout has set for a minimum of seven (7) days. Resulting voids shall be completely filled with grout. Shims shall be coated to prevent bonding and located to facilitate removal.

3.6.7 Leveling screws shall be either "backed off" three turns, cutoff flush and ground smooth or completely removed after grout has cured. When leveling screws are removed, the remaining cavity shall be filled with grout.

3.6.8 *Grout Depth.* The minimum clearance between the top of rough concrete and the bottom of sole plate or base plate shall generally be in accordance with the following table:

Base Plate Least Plan Dimension (Distance Grout Must Flow)	Minimum Depth of Grout
24 inches or less	1½ inches
Over 24 inches to 30 inches	1¾ inches
Over 30 inches to 36 inches	2 inches

For each 12 inches of additional width over 36 inches add ½ inch of depth.

3.7 FINISHING

3.7.1 *Cement-Based Grout.* After sand-cement or precision grout has reached an initial set it shall be trimmed back to the level indicated on the Drawings. When not shown on the Drawings, trim back at a 45° angle from a line 1/8-inch above the bottom of base toward the forms.

3.7.2 *Epoxy Grout.* Epoxy grout cannot be trimmed after set and must be left at finished level with all chamfer strips built into forms. Top surfaces shall be finished in accordance with the manufacturer's recommended procedures for providing a smooth surface. All finishing after the initial set will require grinding.

3.8 CURING

3.8.1 *Cement-Based Grout.*

3.8.1.1 Sand-cement and precision grout shall be cured according to this specification and the manufacturer's recommendations.

3.8.1.2 Temperature of the foundation concrete, base and grout shall be maintained between 45°F and 90°F during grouting and for a minimum of 24 hours. Where grouting at temperatures below 45°F or above 90°F has been approved, follow the manufacturer’s written instructions for steps to be taken to compensate for low or high temperatures.

3.8.1.3 Grout shall be protected from extreme drying conditions by covering exposed grout surfaces with waterproof sheet material for a minimum of three days.

3.8.2 *Epoxy Grout.*

3.8.2.1 Grout shall be cured in accordance with the manufacturer's specifications and recommendations.

3.8.2.2 Temperature of the foundation concrete, base and grout shall be maintained between 60°F and 90°F during grouting and for a minimum of 24 hours. Where grouting at temperatures below 60°F or above 90°F has been approved, follow the manufacturer’s written instructions for steps to be taken to compensate for low or high temperatures.

3.9 TESTING

3.9.1 *General.* The Contractor is responsible for preparing, storing, curing, and transporting test samples for testing to the Testing Laboratory. Contractor’s personnel shall follow the Testing Laboratory’s written procedures for preparing the test specimens.

3.9.2 *Testing Schedule.* Representative samples shall be taken by the Contractor not less than once each day of grout placement and for each 50 cubic feet of each type of grout placed for

strength tests in accordance with ASTM C109 for cement-based grout or ASTM C579 for epoxy grout using brass molds. Nine cubes shall be made for each type of grout. The cubes shall be tested in accordance with the following table:

Grout Type	24 Hours	7 Days	28 Days
Sand-Cement	3	3	3
Precision	3	3	3
Epoxy	3	3	3

3.9.3 *Test Reports.* Copies of the test results shall be submitted to the Owner and Engineer immediately after the test results are available. The report shall include the following information:

- Project name and Wood job number
- Air temperature
- Name of grout
- Location of grout placement
- Description of storage and curing procedures of sample prior to testing.
- Mixing information including amount of grout placed represented by sample and total mixing water for cement grout

3.10. GROUT SCHEDULE

GROUT SCHEDULE				
Type of Equipment	**Sand-Cement Class A or B** *Dry-pack only	**Non-shrink Flowable / Fluid**	**Epoxy**	**Comments**
Stair Landing Supports, Utility Supports and Small Misc Platforms	√			See drawings for locations
Anchor Bolts / Rebar Set in Existing Concrete			√	See drawing for grouting specifications.
Pump Bases		√		With motors < 250 HP
Reducers and Drives		√		
Tissue Machine Sole Plates		√		
Storage Tanks on Legs		√		
Tanks, Flat Bottom		√		
Chimneys, Stacks		√		
Conveyors		√		
Steel Column Base Plates		√		Use flowable mix at shear keys.
Fans		√	√	Use epoxy grout for motors exceeding 250 HP
Air Compressors		√	√	Use epoxy grout for motors exceeding 250 HP
Fan Pumps		√	√	Use epoxy grout for motors exceeding 250 HP

END OF SECTION

CONSTRUCTION SPECIFICATION

wood.

TITLE:	**Structural Steel Framing**	PROJECT DOC. NO.:	**143993-ASA-DD2-SPC-1304**	REV. **0**
PROJECT NAME:	**D.B. Wilson Station FGD Retrofit Project**	PROJECT NO.:	**245891**	
CLIENT:	**Big River Electric Corporation**	AREA NO.:		

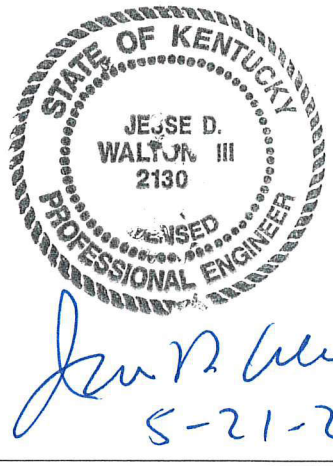
APPROVAL STATUS							
PREPARED BY:	DRF	**DATE**	10FEB21	**CHECKED BY:**	SCK	**DATE**	23FEB21
APPROVED BY:	JDW	**DATE**	12FEB21	**APPROVED BY:**	CLF	**DATE**	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 051200
STRUCTURAL STEEL AND MISCELLANEOUS METAL FABRICATION AND ERECTION

1.0 GENERAL

The purpose of this Specification is to ensure compliance with the American Institute of Steel Construction "Specification for Structural Steel Buildings", June 22, 2010. It is the intent of this Specification to conform to the requirements of this document as a minimum standard.

1.1 SCOPE

This section includes all materials, labor, equipment and services required for fabrication, delivery to the jobsite and erection of all structural steel and miscellaneous metal, as well as related work indicated, in accordance with the Drawings, Construction Specifications and Scope of Work Document. All protective coatings shall be as specified, or as referenced herein.

Where there is a discrepancy between the Drawings and this Specification, the Drawings shall take precedence.

1.1.1 Furnish and install connections for structural steel components.

The Contractor (Steel Fabricator) shall prepare connection design calculations under the supervision of a registered professional engineer licensed in the State of Kentucky for all connections. These calculations shall be submitted to the Engineer along with the detail drawings depicting the designed connections and shall bear the Contractor's Engineer certification and seal.

Proposed connection details, fabrication, quality control and inspection procedures shall be submitted to the Engineer for review and approval prior to commencement of detailing. Details or procedures not included in this submittal or proposed changes to the submittal must be clearly indicated as such and must be submitted immediately after award of contract to allow adequate time for review by the Engineer (see Paragraph 1.5.2).

The design method used (Load and Resistance Factor Design - LRFD or Allowable Strength Design - ASD) and the type of forces used (factored loads or service loads) are noted on the drawings and typical details (see AISC Steel Construction Manual*, 14TH* Edition).

1.1.2 Grouting of base plates shall be included in the General Contractor's scope of work.

1.1.3 The fabrication and performance of steel erection work described in this specification and shown on the Engineer's drawings shall comply with all laws, ordinances, regulations and codes of Federal and State authorities and any local laws and codes.

1.1.4 All structural steel fabricators shall be AISC certified and shall employ and maintain on staff a registered professional engineer in civil/structural engineering.

1.2 OTHER PROJECT SPECIFICATION SECTIONS REFERENCED HEREIN

- Grout – SECTION 036000
- Painting, General – SECTION 099000

1.3 PUBLICATIONS REFERENCED HEREIN (Latest edition unless noted)
All work shall conform to the requirements of these codes and standards, unless noted otherwise.

- American Institute of Steel Construction (AISC), AISC 360-10, Specification for Structural Steel Buildings, June 22, 2010 and AISC 303-10, Code of Standard Practice for Steel Buildings and Bridges, April 14, 2010
- AISC 341-10 *Seismic Provisions for Structural Steel Buildings,* June 22, 2010
- AISC Steel Construction Manual*, 14TH* Edition and related standards
- AISC *Detailing for Steel Construction*, 3RD Edition, August 2009
- Research Council on Structural Connections (RCSC), Specification for Structural Joints Using High-Strength Bolts, December 31, 2009
- American Galvanizers Association (AGA), The Design of Products to be Hot Dip Galvanized after Fabrication
- American *Society for Testing* and Materials (ASTM), Standards as indicated
- American Welding Society (AWS), *Structural Welding Code* D1.1
- National Fire Protection Association (NFPA), *National Fire Code*
- International Building Code, 2015 Edition
- AASHTO LRFD Bridge Design Specification – 6th Edition 2012
- OSHA Regulations – 29 CFR Part 1910 Occupational Safety and Health Standards
- OSHA Regulations – 29 CFR Part 1926 Safety and Health Regulations for Construction

Any discrepancies between various codes and standards shall be referred to the Engineer for clarification.

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and Scope of Work Document.

1.4.2 Owner. Big River Electric Corporation.

1.4.3 Owner's Representative. The authorized representative of the Owner.

1.4.4 Engineer. Wood, doing business as AMEC Foster Wheeler Industrial Power Company, Inc.

1.4.5 Erector. The contractor erecting the structural steel (may be the same as the Fabricator).

1.4.6 Fabricator. The contractor fabricating the structural steel.

1.4.7 Others. Any vendor, contractor, etc., other than the Contractor and Owner herein defined.

1.4.8 Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform testing services required in this specification not otherwise designated, and to perform any other such services requested by the Owner's Representative.

1.4.9 Special Inspections. Inspections required by the International Building Code (Chapter 17) for the materials, installation, fabrication, erection or placement of components and

connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

1.5 SUBMITTALS

1.5.1 *General.* The following information shall be submitted to the Engineer for review and appropriate action prior to commencement of work to which submission is applicable:

- Shop Drawings
- Connection details and calculations for connections
- Welder Certification
- Mill Certificates
- Direct Tension Indicator Washers and Installation Procedures
- Testing Laboratory Reports

1.5.2 *Shop Drawings and Calculations for Connections.* Shop drawings shall include all shop and erection details (showing all cuts, copes, connections, holes, bolts, painting and/or galvanizing, etc.). All shop and field welds shall be indicated by AWS standard welding symbols. The required size and quantity of field bolts required for each connection shall be listed. The proper sequence of erection shall be clearly stated. The system of orientation of piece marks shall be fully described. All shop drawings shall be thoroughly checked and approved by the Fabricator's Engineer prior to submittal to the Engineer and if this procedure is not followed, the submittal will be subject to rejection. Shop drawings shall be submitted in an orderly and timely manner to meet the erection schedule.

Shop drawings will be reviewed by the Engineer for general arrangement and design intent only. This review shall in no way relieve the Contractor of his responsibility for correct dimensions, quantities, design, fabrication and proper functioning of materials and equipment, nor in any way alter the requirements of the contract documents. The Engineer shall be allowed a minimum of two working weeks to review and approve shop drawing submittals.

Fabrication shall not start until the revised shop drawings have been reviewed and returned bearing the status of "Released for Production".

Connection details and calculations for connections shall be submitted to the Engineer for review and approval a minimum of three weeks prior to submitting shop drawings related to these connection details.

1.5.3 *Paint Coatings.* Submit protective coatings product certification, color samples, any specialty paint shop certifications, inspection reports and certifications on volatile organic compounds (VOC) as specified in SECTION 099000, Painting, General, of the Construction Specifications.

1.5.4 *Welder Certification.* Demonstration test results and/or qualification papers for each welder who will do any shop or field welding on this project.

1.5.5 *Company Welding Certification.* Demonstration test results and/or qualification papers for the company's welding qualifications.

1.5.6 *Mill Certificates.*

1.5.6.1 Submit copies of the test reports for each heat of steel from which structural steel for this project is taken in accordance with ASTM A6 to the Engineer. If foreign steel is used, obtain additional tests of steel certified by an independent testing agency, approved by the Engineer, to verify that steel meets specified ASTM requirements.

1.5.6.2 Submit copies of the inspection test reports for each production or shipping lot of high strength bolts for this project in accordance with ASTM F3125 to the Engineer.

1.5.7 *Direct Tension Indicator Washers and Installation Procedures.* Submit brand, samples and written installation procedures for direct tension indicator washers to be used on this project for the Engineer's review prior to any installations.

1.5.8 *Testing Laboratory Reports.* Reports of tests or inspections shall be submitted to the Engineer.

1.5.9 *Welding Inspector.* Welding Inspector certification shall be submitted to the Engineer.

1.5.10 *SDNF File.* The Fabricator's steel detailer shall submit their Structural Detailing Neutral File (SDNF) for use by the Engineer.

1.5.11 *Special Inspections Reports*. All special inspections reports shall be prepared and submitted as described in Chapter 17 of the International Building Code and Chapter N of AISC 360.

1.6 SAFETY

The Contractor, Fabricator, Erector and others engaged in performing the work for this specification shall perform their work in a safe manner in accordance with OSHA regulations and all safety requirements of the Owner.

1.7 WORKMANSHIP

1.7.1 *General.* Surfaces exposed to finished view shall be free from fabrication marks. Except where practice for the particular type of metal prohibits, moldings and members shall be mitered, welded and ground smooth at corners and angles. Members shall be true to length and confirmed by field measurements so that field assembly may be done without fillers. All joints and connections shall fit close and tight.

1.7.2 *Welding.* Fabrication and erection welding technique shall conform to the AWS Code. Welders shall be qualified and certified to perform the work required, in accordance with the AWS code or similar requirements.

1.8 ACCESS FOR INSPECTION

The Owner and the Engineer shall have free access to any fabrication, galvanizing or protective coatings process, and/or erection work on any piece of steel for this project which they wish to inspect during and/or upon completion of such work.

1.9 HANDLING AND STORAGE

1.9.1 *Handling.* After shop fabrication, galvanizing and/or application of protective coatings, structural steel members shall be handled with sufficient care to minimize damage. During shipment, sufficient dunnage shall be used to prevent any rubbing of steel against steel.

1.9.2 *Storage.* Galvanized and painted steel shall be loaded and stored so as to prevent the formation of wet storage stains, and shall be protected from contamination and damage. The members shall be stacked or bundled during transport and storage in such a manner as to allow air between the galvanized or protective coating surfaces and provide continuous drainage. Members shall be stored above ground on platforms, skids or other supports.

1.10 WRAPPING AND SHIPPING

Wrapping and shipping shall be accomplished in a manner which will prevent damage. Marking of shipments shall readily identify the material and shall consist of the Contractor's name, project address, Owner's name, Wood project number and the jobsite location where the item is to be installed.

2.0 PRODUCTS

2.1 GENERAL

All materials shall be new and shall conform to the respective specifications and other requirements specified herein, unless otherwise indicated.

2.2 STRUCTURAL AND MISCELLANEOUS STEEL

Shape	Designation	Minimum Yield Stress
W Shapes & WT's cut from W Shapes	ASTM A992 Grade 50	50 ksi
M & S Shapes, C & MC Channels	ASTM A36 ASTM A572 Grade 50	36 ksi 50 ksi
Angles	ASTM A36 ASTM A529 Grade 50	36 ksi 50 ksi
Structural Plates and Bars	ASTM A36 ASTM A572 Grade 50	36 ksi 50 ksi
Round HSS	ASTM A500 Grade C	46 ksi
Square and Rectangular HSS	ASTM A500 Grade C	50 ksi
Standard Pipe	ASTM A53 Grade B Type E or S	35 ksi
HP Shapes	ASTM A572 Grade 50	50 ksi

2.2.1 Galvanizing of structural steel shall be compatible with the structural steel material supplied. Structural shapes, plates and bars shall conform to the ASTM Specifications listed above, except that the silicon content shall be in the range of 0 to 0.04% or 0.15 to 0.22% only. Mill certificates shall be furnished to note compliance with these requirements as per Paragraph 1.5.6.

2.2.2 *Heavy Section Charpy V-Notch Requirements*. Rolled Heavy Shapes and Built-Up Heavy Shapes shall meet the requirements of AISC 360-10 Sections A3.1c and A3.1d.

Structural steel shapes used in the Seismic Load Resisting System (SLRS) with flanges 1 ½ inches and thicker shall have a Charpy V-Notch (CVN) toughness of 20 ft-lbf at 70°F tested in the alternate core location as described in ASTM A6 Supplementary Requirement S30 in addition to the requirements of AISC 360.

Plates 2 inches and thicker used in the Seismic Load Resisting System (SLRS) shall have a minimum Charpy V-Notch (CVN) toughness of 20 ft-lbf at 70°F measured at any location permitted by ASTM A673, Frequency P, for members built-up from plate, connection plates where inelastic strain under seismic loading is expected and for steel core plates of buckling-restrained braces.

2.3 BOLTS (including suitable hex nut and ASTM F436 washer for each bolt).

- High Strength Bolts. ASTM F3125 Grade A325 or Grade A490, Type 1
- Unfinished Bolts. ASTM A307, Grade A.
- Nuts. ASTM A563 heavy hex
- Washers. ASTM F436
- Protective Coating. All bolts (except ASTM F3125 Grade A490), nuts and washers, shall be galvanized by coatings of zinc mechanically deposited on iron and steel in accordance with ASTM B695, Class 50, Type 1. ASTM F3125 Grade A490 bolts shall be black (plain).
- Direct Tension Indicator Washers. ASTM F959, mechanically galvanized.

2.4 WELDING ELECTRODES

2.4.1 Welding electrodes shall be in accordance with AWS D1.1.

[Note: AWS A5.1 or A5.5, E70XX, are generally required for shielded metal arc welding; AWS A5.17 or A5.23, F7X-EXXX for submerged arc welding; AWS A5.l8, ER70S-X for gas metal-arc welding, and AWS A5.20, E7XT.X for flux cored arc welding].

2.4.2 *Shop welding of connections in the Seismic Load Resisting System*. All welds used in members and connections in the Seismic Load Resisting System shall be made with a filler metal that can produce welds that have a minimum Charpy V-Notch toughness of 20 ft-lbf at 0°F, as determined by the appropriate AWS A5 classification test method or manufacturer certification.

2.4.3 *Field welding of column splices.* All column splices using complete-joint-penetration welds shall be made with a filler metal that can produce welds that have a minimum Charpy V-Notch toughness of 20 ft-lbf at minus 20°F, as determined by the appropriate AWS classification test method or manufacturer certification.

2.4.4 *Complete-joint-penetration (CJP) groove welds between columns and base plates.* All CJP groove welds between columns and base plates shall be made with a filler metal that can produce welds that have a minimum Charpy V-Notch toughness of 20 ft-lbf at minus 20°F, as determined by the appropriate AWS classification test method or manufacturer certification.

2.4.5 *Field welding of connections in the Seismic Load Resisting System.* All welds used in members and connections in the Seismic Load Resisting System shall be made with a filler metal that can produce welds that have a minimum Charpy V-Notch toughness of 20 ft-lbf at 0°F, as determined by the appropriate AWS A5 classification test method or manufacturer certification.

2.4.6 Welding shall not be performed when the ambient temperature is lower than 0°F per AWS D1.1, Section 5.12.2.

2.5 SHEAR CONNECTOR STUDS

2.5.1 *General.* Shear connector studs shall be made from ASTM A108 cold drawn bar stock and shall conform to AWS D1.1 requirements for Type B studs (60,000 psi minimum tensile strength). Studs shall have fluxed tips and shall be supplied with manufacturer's standard ferrules for use on flat surfaces and corners as required.

2.5.2 Stud welding, workmanship, technique, qualifications, production control, and inspections shall conform to AWS D1.1 requirements.

2.6 FRAMES IN MASONRY WALLS

Door, window and miscellaneous frames in masonry walls shall be shop-fabricated from steel shapes and painted. Corners shall be mitered, welded and ground smooth. Frames shall be square. Heads, jambs and sills shall be straight to line. Anchor straps shall be as indicated on drawings. Unless otherwise indicated, door stops shall be seal-welded to frames, exterior window stops shall be seal-welded to frames and interior window stops shall be attached to frames with flat headed, countersunk screws, prior to being shipped to jobsite. Provide clip angles at door sills, welded to frames and pre-punched or drilled for expansion bolts. All exposed surfaces of frames shall be finished smooth without voids, pits, mill scale, rust or weld spatter. Frames for fire-rated doors shall comply with the requirements of NFPA 80, *Standard For Fire Doors and Windows*, current edition.

2.7 ANCHOR BOLTS AND ANCHOR STRAPS

Anchor bolts and anchor straps to be embedded in concrete or built into masonry shall be galvanized steel complying with ASTM F1554 Grade 36 or ASTM A36 respectively, unless otherwise indicated or specified. Expansion or toggle bolts, if required, shall be approved types of galvanized or corrosion resistant metals, suitable for the items to be anchored. Bolts and nuts for anchoring wood members shall be provided with washers.

2.8 SLEEVES

Sleeves for piping or conduit passing through concrete or masonry shall provide at least one inch clearance on all sides of insulated and uninsulated piping or conduit, if not otherwise indicated. Sleeves shall be seamless or welded galvanized steel pipe with wall thicknesses equal to Schedule 40 pipe, or as otherwise approved by the Engineer. Anchorage into concrete or masonry shall be as shown on the Drawings.

2.9 GUARD RAILING AND SAFETY GATES

Guard railing posts and rails shall be welded construction, shop-fabricated from carbon steel, ASTM A53, Grade B, Type E pipe and hot-dip galvanized after fabrication. Fit post to top rail and intermediate rails to post. Bend rails continuously at corners except at corners with posts. Groove-weld all joints and grind smooth. Splice joints in rails shall occur next to posts within $^1/_6$ of the span if indicated or otherwise approved by the Engineer. Field welds shall be ground smooth and finished to match adjoining surfaces. Guard rail posts shall be spaced as shown on the Drawings. Vent and drain holes shall be provided as required in ASTM A385.

Safety gates at guard rail openings shall be self-closing, fabricated with a minimum of one top and one bottom rail.

2.10 LADDERS

Ladders, ladder cages and rungs shall be shop-fabricated in accordance with AISI, ANSI A14.3 and the Drawings. All ladders and their parts shall be galvanized. Steel shall be fabricated from ASTM A36 or ASTM A572 Grade 50 material. Anchoring angles, plates and bolts shall be provided as required to secure ladders in place. Surfaces of ladder rungs shall be non-slip in accordance with OSHA requirements.

2.11 FLOOR GRATING AND STAIR TREADS

Floor grating shall be electro-forged welded, ASTM A1011, plain surface steel bar grating with 1¼ inches by $^{3}/_{16}$ inch bearing bars spaced at $1^{3}/_{16}$ inches and with cross bars spaced at 4 inches. Grating shall be fabricated so that cross bars of adjacent panels are aligned when installed. Each hole or opening greater than 8 inches shall be banded with a 5¼ inches x $^{3}/_{16}$ inch band, welded to the cut-portions of the grating. Floor grating shall be hot-dip galvanized after fabrication. Grating that is inclined, in wet areas, or used in outdoor platforms and walkways shall have a serrated surface.

Stair treads shall be of the same material as the floor grating specified hereinbefore with the tread widths not less than those specified on the Drawings, including a minimum 1¼ inches wide by full length of the tread, steel raised-pattern checkered plate nosing. Stair treads shall be hot-dip galvanized after fabrication.

Floor grating and stair tread requirements shall be as specified on the Drawings.

2.12 CHECKERED PLATE

Checkered plate shall be skid-resistant, raised-pattern floor plate of commercial quality, ASTM A786, galvanized steel plate as specified on the Drawings.

2.13 CONCRETE STAIR AND LANDING NOSINGS

Concrete stair treads and concrete landings shall have a 3 inches wide cast iron with ¼ inch nose lip, cross-hatched abrasive pattern top and cast-in or other suitable anchor nosing by the full width of the stair tread less 3 inches at each tread and each landing.

2.14 BUILDING DRAINS

Building floor and roof drains shall be as indicated on the Drawings.

2.15 CRANE RAILS AND CONNECTIONS

Crane rails shall conform to ASTM A759, ASTM A1 and/or the manufacturer's specifications and tolerances. Crane rail splices (bolted or welded) shall be as indicated on the Drawings. For bolted splices, steel joint bars shall conform to ASTM A49 and joint bar bolts shall conform to ASTM F3125 Grade A325 with compatible ASTM A563 nuts. For welded splices, consult the manufacturer for recommended rail-end preparation and welding procedure.

Rails shall be attached to the crane girder using patented rail clip fastenings and pads as manufactured by Gantrex or an Engineer approved equal.

2.16 OTHER FABRICATED ITEMS

Other miscellaneous metal fabricated items indicated on the Drawings shall be fabricated and furnished in accordance with final reviewed and completed shop drawings.

2.17 GASKETS

Electrolysis-proof gaskets shall be neoprene or other suitable material of sufficient thickness to provide insulation to prevent electrolytic action between dissimilar materials as indicated on the Drawings or approved by the Engineer.

2.18 STRUCTURAL AND MISCELLANEOUS STEEL FABRICATION

2.18.1 *General.* Fabrication and delivery shall be performed in accordance with the AISC 303 *Code of Standard Practice for Steel Buildings and Bridges.* Permissible variations for sweep, camber, length, and cross section of all steel members shall conform to ASTM A6, AISC Manual, Part 1 and AISC Code of Standard Practice. Steel shall be fabricated and assembled in the shop to the greatest extent feasible. Bolts and other loose fasteners shall be delivered to the jobsite with the members being connected with sufficient quantities and overages to meet the erection requirements.

2.18.2 *Connections.* Connection materials, design, installation and inspections of bolted connections shall conform to the RCSC *Specification for Structural Joints Using High-Strength Bolts.* Connections shall be fabricated to conform to the approved shop drawings.

2.18.3 *Shop Connections*. Shop connections may be welded or bolted, unless otherwise indicated. Welded connections shall be shop fabricated unless otherwise specified on the Drawings.

All shop welded connections shall be such that resulting hidden surfaces are continuously seal-welded, unless otherwise approved by the Engineer. No shop welding is permitted after hot-dip galvanizing.

Shop bolted connections shall not be assembled until after the individual components have been galvanized and faying surfaces appropriately roughened by hand wire brushing only.

2.18.4 *Field Connections*. Field connections shall be bolted using high strength bolts, except where field welding is specified on the Drawings.

2.18.5 *Bolted Connections*. Bolted connections shall be bearing type with threads included in the shear plane, unless otherwise indicated on the Drawings. All high strength bolted type connections shall have the bolts fully pretensioned.

All faying surfaces for connections that are part of the Seismic Load Resisting System shall be prepared as required for Class A Slip-Critical Joints.

Bolted joints shall not be designed to share load in combination with welds on the same faying surface.

Where framed beam reactions are not shown on the Drawings, the end connections shall be designed for an end reaction equal to one-half of the maximum total uniform load (for W-shapes having braced compression flanges with $L_b<L_p$, with simple-span bent about the strong axis) found in the AISC Beam Tables (14^{th} Edition, Table 3-6) for the given span, considering bolt, beam web and clip angle capacities per the AISC 360 Specifications.

Connections shall have no fewer rows of bolts than as follows:

NOMINAL BEAM SIZE	MINIMUM BOLT ROWS
W8 & W10	2
W12 & W14	3
W16	4
W18	5
W21 & W24	6
W27	7
W30 & W33	8
W36	10

Beam connections shall be double angle type connections similar to those shown in AISC 14th Edition Table 10-2 with the connecting angles welded to the full available depth of the beam, unless otherwise noted. One-sided or other types of eccentric connections are not permitted except for large skew angle connections or where shown on the Drawings or where called to the Engineer's attention, shown in detail and individually approved by the Engineer prior to submitting detailed shop drawings.

2.18.6 *Bolt Holes.* Bolt holes shall be drilled or punched at right angles to the surface of the metal and shall not be made or enlarged by burning. Outside burrs shall be ground smooth and all sharp or rough edges or corners shall be ground smooth and slightly rounded.

2.18.7 *Column Ends.* Column ends at base plates, cap plates and splices shall be accurately sawed or otherwise finished to a true plane by any suitable means, unless otherwise indicated. Thermal cutting shall be in accordance with AISC 360 Specification, Section M2.2 and AWS 5.15.4. Grinding may be required to meet Roughness Requirements in AWS 5.15.4.3. Jumbo Shape Columns, W14x426 thru W14x730 shall have the ends milled, unless otherwise indicated.

2.18.8 *Base and Cap Plates.* Base plates and cap plates shall provide full contact bearing surfaces between the column and base plate in accordance with AISC 360 Specification, Section M2.8, Finish of Column Bases. Base plates in which the least dimension is greater than 24 inches shall be provided with grout holes located as close to center as practicable and a minimum of 2 inches in diameter.

2.18.9 *Column Splices*. Column splices shall be detailed as shown in the AISC Steel Construction Manual 14th Edition, Table 14-3 using all bolted flange-plated column splices, unless otherwise indicated. Columns in the vertical Seismic Load Resisting System shall have directly welded flange column splices using complete-joint-penetration groove welds with tapered transitions between flanges of unequal thickness or width.

2.18.10 *Stiffeners.* Stiffeners shall be fitted neatly between the flanges and welded as shown on the Drawings. Corners shall be cropped corners or drainage holes provided for drainage.

2.18.11 *HSS Sections.* Exposed ends of any pipe or HSS section shall be closed with a $^{3}/_{16}$ in. steel plate cut to fit the cross-section of the member and seal-welded all around the

perimeter. Where sections are to be hot-dip galvanized after fabrication, the sections shall be properly vented and include drain holes for the completed assembly.

2.18.12 *Trusses.* Connect chord and web members at intersecting points along the top and bottom chords in accordance with AISC “Specification for Structural Steel Buildings”. Design and weld all web member to chord connections to develop loads shown on the Drawings using gusset plates where required. Detail connection joints where the center of gravity of all connecting members intersect at a common panel point. Design and detail truss connections to columns and truss splice connections as indicated in AISC “Detailing for Steel Construction” and “Steel Construction Manual”. Provide camber in trusses as indicated on the Drawings.

2.18.13 *Bracing.* Design bracing connections where all force components can be delivered directly to center of gravity of intersecting members, unless otherwise indicated. Where bracing force components do not intersect at a common point, design connections to account for resulting eccentricities.

2.18.14 *Crane Rails*. Fabricate crane rails with finished ends for close fit using bolted or welded joints as indicated on the Drawings. Arrange rails so that joints on opposite sides of the crane runway will be staggered with respect to each other and with due consideration to the wheelbase of the crane. Ensure rail joints do not occur closer than four feet from crane girder joints. Use odd crane rail lengths not less than ten feet long to complete a run or necessary stagger. Rail clamps shall be set as pairs and are not to be staggered. Space clamps a minimum of three feet on center or closer if recommended by the manufacturer of the rail clamps. Provide crane stops on crane rails and countersink holes in wood bumpers for nuts, bolts and washers as shown on the Drawings.

2.18.15 *Marking.* Piece mark each piece of steel with at least one appropriate identifying mark which can be easily read after completion of fabrication and application of the protective coating(s). Permanent steel piece mark tags may be used where seal-welded to the steel and the piece mark remains readable. Paint stick marks which cannot be fully obliterated after erection, shall not be used.

2.18.16 *Welded Joints.* Welding shall be performed in accordance with the Welding Procedure Specification (WPS) established for the particular type joints being welded as required in AWS D1.1 and as approved by the Engineer. The WPS variables shall be within the parameters established by the filler metal manufacturer.

2.19 WELDING INSPECTION

2.19.1 Inspection Procedures and Responsibilities

The Fabricator and Erector shall be responsible for inspection of all shop and field welding with special attention to AWS D.1.1, Section 6 “Inspection” including Paragraph 6.6 “Obligations of the Contractor”.

All inspection shall be performed by AWS certified welding inspectors certified in conformance with the provisions of AWS QC1.

The Fabricator and Erector shall submit to the Engineer for review and approval a copy of the quality control and assurance standards for welding procedures to be used to maintain good welding quality in making shop and field welds.

Copies of all shop and field weld inspections and test reports shall be submitted weekly to the Engineer by the Fabricator and Erector AWS Inspector.

The Owner reserves the right to perform independent inspections using his own testing agency or independent inspectors to inspect and test shop and field welding procedures, completed welds and welding quality at the Owner's own expense. The Owner's inspections do not relieve the Fabricator and Erector from the responsibility for inspections. Any deficiencies identified during inspections by the Owner shall be corrected by the Fabricator or Erector at their expense.

2.19.2 Visual Inspection

All welds shall be visually inspected by the AWS Inspector. Where welds do not meet the acceptance criteria of AWS D1.1, Section 6, Part C, Table 6.1, the Fabricator or Erector shall correct all deficiencies at their own expense.

Where visual inspection indicates an unsatisfactory standard of welding of more than 2% of weld inspections being rejected, non-destructive testing of welds selected by the AWS Inspector shall be performed. Non-destructive testing shall continue until the following parameters are met:

- Visual inspection indicates rejection of less than 2% of the welds, then further non-destructive testing may not be required.
- Visual inspection indicates rejection greater than 2% but less than 50% of the welds inspected, non-destructive testing will be required of 10% of all welds of the type rejected.
- Visual inspection indicates rejection of more than 50% of the welds inspected, non-destructive testing will be required of all welds of the type rejected.

2.19.3 Non-Destructive Testing

Non-destructive testing shall be radiographic or ultrasonic testing depending on the method most suitable for the type of weld being tested. Non-destructive testing shall be performed in addition to visual inspections as follows:

Weld Description	**Percent of Welds to be Tested**
Full Penetration Welds in material > 5/8" Thick	5%
Fillet Welds >1/2"	5%
Welded Moment Connections in Moment Resisting Frames	100%
Welded Truss Chords and Column Splices	100%
Welded Beam Splices (only as permitted by the Engineer after splicing procedure approval)	100%

Non-destructive testing shall be performed at all critical locations such as moment connections to ensure that the welded metals and material are free from laminations.

All deficiencies identified by non-destructive testing shall be corrected by the Fabricator or Erector at their own expense.

2.19.4 Inspections shall follow scheduled criteria within Chapter 17 of the International Building Code and Chapter N of AISC 360, and will be performed by the Inspection Agency/Testing Laboratory.

2.20 PAINTING

Protective coating paint system shall be applied in the shop in accordance with SECTION 099000, Painting, General, of the Construction Specifications.

2.21 ZINC COATING OF STEEL (HOT-DIP GALVANIZING)

2.21.1 Galvanizing shall be performed after fabrication as applicable to items specified to be galvanized. Galvanizing shall be performed in accordance with ASTM A123 to deposit zinc (hot-galvanized) coatings on products fabricated from rolled, pressed and forged steel shapes, plates, bars and strips.

2.21.2 Other Applicable ASTM Standards:

- A90, Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- A143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
- A153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A384, Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
- A385, Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip)
- A780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- B6, Standard Specification for Zinc
- B695, Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
- E376, Standard Practice for Measuring Coating Thickness by Magnet-Field or Eddy-Current (Electromagnetic) Examination Methods

2.21.3 *Surface Preparation.* All surfaces that are required to be galvanized shall be cleaned to bare metal by degreasing, pickling, rinsing, fluxing, etc., in accordance with the standards of the American Galvanizing Industry.

2.21.4 *Embrittlement.* The Fabricator and Galvanizer shall guard against embrittlement of steel members in accordance with ASTM A143. Tests for embrittlement shall be documented and submitted to the Engineer.

2.21.5 *Warpage.* Steel members that are warped beyond the dimensional tolerances allowed by ASTM A6 shall be straightened and repaired before shipment to the construction site.

2.21.6 *Zinc Bath.* The composition of metal in the galvanizing bath shall not be less than 98.0% zinc.

2.21.7 *Coating Thickness.* Coating thickness shall be as specified in ASTM A123 (2.3 oz./sq. ft. average, 2.0 oz./sq. ft. individual specimens). Tests required for coating thickness per ASTM A123 shall be documented and submitted to the Engineer. In addition, three stripping tests shall be conducted in accordance with ASTM A90. Test specimens shall be cut approximately 4 inches in length and be made of the same type and shape as the

material being galvanized. The total zinc on each specimen shall be determined in a single stripping operation. Failure to satisfy the coating thickness requirements constitutes grounds for rejection of the entire lot, unless the members are accepted by test on an individual basis in accordance with ASTM A123, Section 8.3.

2.21.8 *Surface Finish and Adhesion.* The galvanized coating shall be continuous, adherent, smooth, evenly distributed and free from any defect that is detrimental to its end use. The galvanized coating shall be sufficiently adherent to withstand normal handling during transport and erection.

2.21.9 *Galvanizing Repair.* Field repair of damaged galvanized zinc coatings shall be done in accordance with ASTM A780, Section 4.2.2 and Annex A2. The minimum thickness of the repair coat shall be equal to the thickness of the hot-dip galvanized coating as specified in Paragraph 2.21.7. Shop repair shall be by hot-dip galvanizing.

2.21.10 Bolt holes shall be cleared of excess zinc in order to allow the specified bolt clearance.

2.21.11 Welding or flame cutting of galvanized steel or parts of galvanized steel shall not be permitted without prior written approval of the Engineer.

3.0 EXECUTION

3.1 ERECTION AND INSTALLATION

3.1.1 GENERAL

Erection and installation shall be performed in accordance with the AISC 360 Specification, AISC 303 Code of Standard Practice, the manufacturer's printed instructions and the "Released for Production" shop drawings, as applicable, unless otherwise indicated.

Prior to erection of structural steel and miscellaneous metal fabrications, installation of all anchor bolts shall be verified and checked as to their correct projection and location. Any discrepancies shall be reported to the Engineer.

Each part of the structure shall be plumbed and aligned to required tolerances before completing field connections. Drift pins shall not be driven so as to damage adjoining members.

Any significant condition of misfit in structural steel shall be reported to the Engineer for correction instructions. The Erector shall be responsible for making any Engineer approved misfit corrections, at no expense to the Owner. Correction of minor misfits and a reasonable amount of reaming or punching of blind holes shall be considered a normal part of the structural steel erection. Enlarging of bolt holes by gas cutting is not permitted.

No cutting of any structural steel members will be permitted without written approval from the Engineer.

3.1.2 ERECTION SAFETY REQUIREMENTS

- The concrete in the supporting foundations must have attained a minimum of 75% of the minimum compressive strength prior to beginning structural steel erection.
- Structural stability shall be maintained at all times during the erection process.
- Shear stud connectors shall not be attached to the top flanges of beams, joists or beam attachments so that they project vertically above or horizontally across the top flange of the member until after the metal decking or other walking surface has been installed.
- All columns shall be anchored with a minimum of 4 anchor bolts.
- Each column anchor bolt assembly, including the column-to-base plate weld and the column foundation, shall be designed to resist a minimum eccentric gravity load of 300 pounds located 18 inches from the extreme outer face of the column in each direction at the top of the column shaft.
- When two structural members on opposite sides of a column web, or a beam web over a column, are connected sharing common connection holes, at least one bolt with a wrench-tight nut shall remain connected to the first member unless a shop-attached or field-attached seat or equivalent connection device is supplied with the member to secure the first member and prevent the column from being displaced.
- If a seat or equivalent device is used, the seat (or device) shall be designed to support the load during the double connection process. It shall be adequately bolted or welded to both a supporting member and the first member before the nuts on the shared bolts are removed to make the double connection.
- Column splices shall be designed to resist a minimum eccentric gravity load of 300

pounds located 18 inches from the extreme outer face of the column in each direction at the top of the column shaft.

- Perimeter columns shall extend a minimum of 48 inches above the finished floor to permit installation of safety cables prior to erection of the next tier, except where constructability does not allow.
- The perimeter columns shall have holes or other devices in or attached to them at 42 to 45 inches above the finished floor and the midpoint between the finished floor and the top cable to permit installation of perimeter safety cables, except where constructability does not allow.

3.1.3 COLUMN BASES AND BEARING PLATES

Column base plates and bearing plates shall be aligned and solidly supported on at least 3 pairs of wedges, shims, or leveling screws. All shims or wedges shall have full bearing and be so positioned that the hollow spaces under each plate can be filled solid with grout and the shims can be removed.

After plates shipped loose to the job have been correctly positioned, grout shall be placed.

After members with shop-connected plates have been properly positioned and connections of other members to these members have been completed, anchor bolt nuts shall be snug tightened and grout shall be placed.

The grouting of base plates shall be in accordance with SECTION 036000, Grout, of the Construction Specifications.

Wedges, shims, or leveling screws shall be removed after the grout has set for a minimum of seven (7) days. Resulting voids shall be completely filled with grout and the anchor bolt nuts shall be retightened.

3.1.4 GRATING ANCHORAGE

Grating shall be anchored to supporting steel with Hilti X BT Grating Fastening System, clip-type connections with powder actuated fasteners. Provide a minimum of two anchors to each steel support member and a minimum of four anchors per grating panel.

3.1.5 INSTALLATION AND INSPECTION OF HIGH STRENGTH BOLTS

Installation and inspection of high strength bolts shall be in accordance with the RCSC Specification for Structural Joints Using High-Strength Bolts, Sections 8 and 9 using Turn-of-nut, Twist-Off-Type Tension-Control Bolt or Direct-Tension-Indicator pretensioning. All high strength bolts shall be fully pretensioned. Special washer requirements given in the RCSC Specification, Section 6 shall be used for special conditions such as those related to slotted holes. Pre-installation verification of fastener assemblies shall be in accordance with the RCSC Specification, Section 7.

A representative sample of not fewer than three complete fastener assemblies of each combination of diameter, length, grade and lot to be used in the work shall be checked at the jobsite in a tension calibrator such as a Skidmore Wilhelm calibrator to verify that the pretensioning method selected develops a pretension that is equal to or greater than 1.05 times that specified for installation and inspection given in the RCSC Specification, Table 8.1. Washers shall be used in the pre-installation verification assemblies as required in the work in accordance with the requirements in the RCSC Specification, Section 6.2.

Bolts with Direct Tension Indicator (DTI) washers shall be installed in strict accordance with the RCSC Specification, Section 8.2.4 and the manufacturer's printed installation procedures. DTI washers shall be used on all bolts for the connection and initially brought to a snug tight condition without causing one-half or more of the gaps between the arch-like protrusions to close to 0.005 in. or less for coated direct tension indicators. All bolts shall then be pretensioned, progressing systematically from the most rigid part of the connection to the free edges in a manner that will minimize relaxation of previously pretensioned fasteners. In some cases, more than a single cycle of systematic partial pretensioning may be required to deform the direct tension indicator protrusions to the gap that is specified by the manufacturer.

DTI washers shall be mechanically galvanized. The protrusions must face a hardened stationary unturned surface of a hardened washer or the bolt head when it is not the turned element. It must not face the nut or clamped element without a hardened washer separator.

Inspections shall also follow scheduled criteria in SECTION 014533, Special Inspections and Tests, of the Construction Specifications. Inspections will be performed by the Inspection Agency/Testing Laboratory.

3.1.6 INSTALLATION OF SHEAR CONNECTOR STUDS

Installation of shear connector studs shall be performed in the field by automatic welding to the structural steel with a suitable stud welding gun, as recommended by AWS D1.1, unless otherwise approved by the Owner's Representative.

3.1.7 INSPECTION AND ACCEPTANCE OF SHEAR STUD WELDING

Welding of shear connector studs to structural steel shall be supervised by the Inspection Agency/Testing Laboratory, tested by the Erector in accordance with AWS D1.1 and corrected as necessary by the Erector at their own expense.

3.1.8 INSPECTION OF WELDS

Where indicated on the Drawings or requested by the Owner or Engineer, the Inspection Agency/Testing Laboratory shall inspect and test field welds.

3.2 TEMPORARY SHORING AND BRACING

The Erector shall determine, furnish and install temporary shoring and bracing members with connections of sufficient strength to bear imposed loads until permanent structural elements are in place and capable of supporting the loads.

Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds. Remove temporary connections and members when permanent members are in place and final connections are made. At concrete floors, temporary bracing shall be left in place until the concrete has obtained a minimum of 75% of the design compressive strength. Shore existing members when unbolting of common connections is required. In cases where permanent stability of steel depends on other parts of the building such as masonry, timber or concrete work, thoroughly brace and keep steel framework plumb and in position against wind, weather or other damaging conditions until other supporting parts are in place.

3.3 WET STORAGE STAIN

Any wet storage stains shall be removed prior to installation. A coating thickness check shall be made in the affected areas to ensure that the thickness of the remaining coating satisfies the requirements of the protective coating system.

3.4 PROTECTION FROM ELECTROLYTIC ACTION

Dissimilar materials which could cause corrosion if in contact with each other shall be protected from electrolytic action by electrolytic-proof gaskets.

3.5 FIRE-RATED DOOR FRAMES

Fire-rated door frames shall be installed in accordance with NFPA 80, *Standard for Fire Doors and Windows*.

3.6 ERRORS OR DAMAGE

Errors or damage resulting from handling, transportation or improper fabrication that prevents the proper assembly and fitting of parts shall be reported to the Owner's Representative. The Contractor shall correct all errors and damage as directed by the Owner's Representative. The use of a gas cutting torch in the field is not permitted.

3.7 TOUCH-UP PAINTING

Upon arrival at the jobsite and after erection, steel shall be touched up as required, in accordance with SECTION 099000, Painting, General, of the Construction Specifications.

3.8 TOUCH-UP GALVANIZING

All damaged galvanizing shall be fully replaced by the use of an approved galvanizing repair paint containing zinc dust. The damaged area shall be thoroughly cleaned by wire brushing and other means in accordance with instructions of the galvanizing applicator.

3.9 CLEANING UP

3.9.1 *Progress Cleaning.* During the progress of the work, the Contractor shall keep the premises in a neat and orderly condition, free from construction debris. Finished surfaces shall be kept thoroughly clean, free from mud, dirt and other foreign matter.

3.9.2 *Final Cleaning.* Prior to final acceptance of the work by the Owner, the Contractor shall remove from the site all of his tools, equipment, scaffolding, temporary structures and surplus materials, clearing the site to the satisfaction of the Owner's Representative.

3.10 SPECIAL INSPECTION

Special inspections and tests of steel construction shall be in accordance with the International Building Code, Section 1704 "Special Inspections and Tests, Contractor Responsibility and Strucutral Observation" and Section 1705 "Required Special Inspections and Tests", and the quality control and quality assurance inspection requirements of AISC 360, Chapter N.

END OF SECTION

CONSTRUCTION SPECIFICATION

wood.

TITLE:	**SPECIAL INSPECTIONS AND TESTS**	PROJECT DOC. NO.:	**143993-ASA-DD2-SPC-1305**	REV. **0**
PROJECT NAME:	**D.B. Wilson Station FGD Retrofit Project**	PROJECT NO.:	**245891**	
CLIENT:	**Big River Electric Corporation**	AREA NO.:		

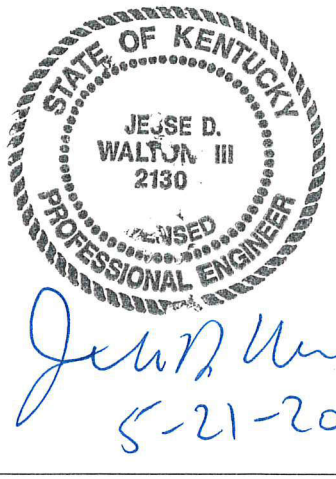
APPROVAL STATUS							
PREPARED BY:	DRF	DATE	10FEB21	CHECKED BY:	SCK	DATE	23FEB21
APPROVED BY:	JDW	DATE	12FEB21	APPROVED BY:	CLF	DATE	01APR21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	DRF	JDW			12FEB21
B	BID	SCK	JDW	CLF	NDH	01APR21
0	CONSTRUCTION	SCK	JDW	CLF	NDH	20MAY21

Permit Stamp

Engineer's Seal



SECTION 014533

SPECIAL INSPECTIONS AND TESTS

1 GENERAL

1.1 SCOPE

1.1.1 This Section describes requirements for structural special inspections and testing services required to verify that all field fabricated, shop fabricated and installed work for the structural framework, structural welding, structural bolting, miscellaneous steel, concrete shear studs, anchorage systems, concrete and concrete reinforcing, foundations, grouts, and supports and attachments of designated seismic systems and architectural, mechanical and electrical components are supplied and installed in accordance with the Construction Specifications and Drawings.

1.1.2 Special Inspections shall satisfy the minimum requirements outlined in Chapter 17 of the 2015 International Building Code, along with this Section and other project construction documents. In case of conflict between the Construction Specifications and this Section, this Section shall govern the inspection requirements. In case of conflict between the Drawings and this Section, the Drawings shall take precedence over this Section.

1.1.3 The Owner or the registered design professional in responsible charge, acting as the Owner's agent, shall employ one or more approved agencies to perform inspections during construction on the types of work listed in this Section.

1.1.4 The Inspection Agency shall coordinate the work described by this Section with the Construction Specifications and Drawings. The Special Inspectors employed by the Inspection Agency shall coordinate the inspection work and document all of their inspections in written reports in accordance with the Project Quality Assurance / Quality Control program administered by the Construction Manager (or his designee) and the Owner's Representative.

1.1.5 The special inspection requirements of the local Authorities Having Jurisdiction (AHJ) will be defined by that agency and are part of the Inspection Agency's scope of services. The AHJ requirements are the minimum inspection requirements. In the event that this Section and the AHJ requirements are in conflict, the Owner's Representative shall be informed of such variances in writing.

1.2 DEFINITIONS

1.2.1 Inspection Agency. An established and recognized company, partnership, or corporation regularly engaged in conducting tests or furnishing inspection services. The Inspection Agency shall comply with the technical criteria of ASTM E329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

1.2.2 Approved Fabricator. An established and qualified person, firm or corporation approved by the building official in accordance with Chapter 17 of the 2015 International Building Code (through the AISC Quality Certification Program) to perform structural steel fabrication without Special Inspection.

1.2.3 Inspector/Special Inspector. Employee of the Inspection Agency, who is experienced, qualified and educated in conducting, supervising, evaluating tests and/or inspections and submitting written reports. All Inspectors and Special Inspectors shall be a registered engineer or work under the direct supervision of a registered engineer.

Competence/Certification shall be demonstrated to the satisfaction of the Authorities Having Jurisdiction.

1.2.4 Authorities Having Jurisdiction (AHJ). Local Building Official or Authority, other Enforcement Agency, or other Authorities Having Jurisdiction.

1.2.5 Owner. Big River Electric Corporation

1.2.6 Owner's Representative. The authorized representative of the Owner.

1.2.7 Contractor. Company, partnership, or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and Scope of Work Document.

1.2.8 Engineer/Engineer of Record. Engineer of Record (EOR) are engineers working for an engineering firm in responsible charge for the engineering design(s) of the structure(s) and system(s) and who supervise the engineering work as a Professional Engineer licensed in the State of Kentucky.

1.2.9 Registered Design Professional. Registered Design Professional in responsible charge (RDP) may be employed by the Owner to act as the Owner's agent for the purpose of employing one of more approved agencies to perform inspections during construction.

- The RDP may also be the EOR for the project.
- The RDP and/or the EOR are permitted to act as an approved agency for special inspections and their personnel are permitted to act as the special inspectors for the work designed by the RDP/EOR, provided their personnel are qualified as special inspectors.

1.2.10 Architect/Architect of Record. Architect of Record (AOR) for the architectural design who is a Registered Architect licensed in the State of Kentucky.

1.2.11 Geotechnical Engineer. Geotechnical Engineer of Record (GOR) for the geotechnical design who is a licensed Geotechnical Engineer in the State of Kentucky.

1.2.12 Structural Observation. The visual observation of the structural system by a registered design professional licensed in the State of Kentucky .for general design conformance to the approved construction documents.

1.2.13 Construction Management Quality Assurance Lead (CMQA). CM Quality Assurance Lead (CMQA) reviews and approves Contractor(s) quality control plans to assure compliance with the Drawings, Construction Specifications and Scope of Work Document. The QA Lead also prepares and issues internal quality audit reports identifying any non-conformances and satisfactory corrective actions.

1.2.14 Continuous Special Inspection. The full-time observation of work requiring special inspection by an approved Special Inspector who is present in the area where the work is being performed.

1.2.15 Periodic Special Inspection. The part-time or intermittent observation of work requiring special inspection by an approved Special Inspector who is present in the area where work has been or is being performed and at the completion of the work.

1.2.16 Special Inspections. Inspections required by 2015 IBC, Sections 1704 and 1705 and as amended by this Section for the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

1.2.17 Wind Force Resisting Systems (WFRS). The assembly of structural elements, such as struts, collectors, chords, diaphragms, vertical and horizontal bracing, and trusses used to resist the design wind forces which form the WFRS.

1.2.18 Seismic Force Resisting System (SFRS). The assembly of structural elements, such as struts, collectors, chords, diaphragms, vertical and horizontal bracing, and trusses used to resist the design seismic forces which form the SFRS.

1.2.19 Designated Seismic System. Those architectural, electrical and mechanical systems and their components designed in accordance with Chapter 13 of ASCE 7-10 with an Importance Factor greater than 1.0 as follows:

- Systems and components required to function for life-safety purposes after an earthquake, including fire protection sprinkler systems.
- Components containing hazardous materials.

1.3 SUBMITTALS

1.3.1 A Statement of Special Inspections shall be submitted by the Registered Design Professional in responsible charge (RDP) as a condition for permit issuance to the AHJ. The Statement of Special inspections is included as Attachment **06** and requires the inclusion of Attachments **01** thru **05** to identify the following:

- Materials, systems, components and work requiring special inspections or testing.
- Type and extent of each special inspection.
- Type and extent of each test.
- Additional requirements for special inspection or testing for seismic or wind resistance.
- Identification as to whether each type of special inspection will be continuous or periodic special inspection.

1.3.2 Each Contractor responsible for construction or fabrication of a main wind or seismic force-resisting system or component listed in the Statement of Special Inspections shall submit a Contractor's Statement of Responsibility. An example of a Contractor's Statement of Responsibility is included as Attachment **07** to this Specification.

1.3.3 Inspection reports shall be submitted to the Contractor, CMQA, Owner/Owner's Representative and other designees no later than the second workday following the date of the inspection. Nonconformance reports shall be submitted as soon as possible upon the completion of the inspection or the test.

1.3.4 The Inspection Agency shall submit weekly reports describing the work performed, test documentation and inspection reports for all of the work performed within the reporting period to the Contractor(s), CMQA, Owner/Owner's Representative, RDP and/or EOR (as applicable), Geotechnical Engineer (as appropriate) and other designees.

1.3.5 A final report shall be prepared and submitted by the Inspection Agency(s) documenting the following:

- Required Special Inspections have been performed
- Discrepancies noted in the inspections have been resolved.
- The final report shall be submitted at the completion of the project for occupancy by the Owner.

- The final report will indicate the completed work was in accordance with the approved contract drawings, specifications, and the inspection requirements of Chapter 17 of the 2015 IBC and this Specification.
- This report shall be submitted to the CMQA, Owner/Owner's Representative, RDP and/or EOR (as applicable). A sample final report entitled "Final Report of Special Inspections" is shown in Attachment **09** to this Specification.

1.3.6 Special Inspection is not required for work done on the premises of a structural steel fabricator registered and approved to perform such work (through the AISC Quality Certification Program) without Special Inspection in accordance with 2015 IBC, Section 1704.2.5.1.

The Approved Fabricator shall submit to the CMQA, Owner/Owner's Representative, RDP and/or EOR (as applicable) a certificate of compliance stating that the work was performed in accordance with the approved drawings and specifications. A sample report entitled "Fabricator's Certificate of Compliance" is shown in Attachment **08** to this Specification.

2 EXECUTION

2.1 GENERAL

2.1.1 The Special Inspector shall be a qualified/certified person with demonstrated competence for the type of construction or operation requiring Special Inspection(s).

2.1.2 The Inspection Agency, Special Inspector(s), Owner/Owner's Representative, CMQA, and RDP shall meet at a pre-construction conference to review the Special Inspection(s) requirements.

2.1.3 The Special Inspector shall observe the work for conformance with the approved design drawings and specifications.

2.1.4 The Inspection Agency shall plan and execute inspections and tests to avoid delays in construction operations.

2.1.5 The Inspection Agency shall provide all tools, equipment, and materials required for inspection as well as any safety equipment. Safety equipment includes hard hat, safety shoes, safety glasses, safety harness, and other safety equipment. Site safety procedures shall be followed at all times.

2.1.6 The Special Inspector shall provide means of collecting concrete samples, storing concrete samples, and storage of testing equipment as provided by the Inspection Agency.

2.1.7 All discrepancies noted in the inspection reports shall be brought to the immediate attention of the Contractor, CMQA, RDP and the Owner's Representative for correction. If no corrective action is taken, written notification of the deficiency shall be made to the Contractor, CMQA, RDP and Owner's Representative.

2.1.8 The Contractor shall give a minimum of 72-hours of notification to the Inspection Agency/Special Inspector for work that is ready or will be ready for inspection. The work shall remain exposed and accessible for special inspection purposes until completion of the required special inspection.

2.1.9 The Construction Manager/CMQA shall provide the Special Inspector a set of project construction drawings, shop fabrication drawings, specifications, bulletins, addenda and written modifications or sketches prepared by the EOR.

2.1.10 The Construction Manager/CMQA shall maintain an organized set of job site copies of all reports submitted by the Inspection Agency/Special Inspector.

2.1.11 The Special Inspector shall not suggest, direct or approve deviation from the Contract Documents and approved shop drawings without written approval from the EOR.

3 REQUIRED SPECIAL INSPECTIONS AND TESTS

3.1 GENERAL. Special inspections and tests of elements and nonstructural components of buildings and structures shall be as required by this Section.

3.2 STEEL CONSTRUCTION

3.2.1 Special inspections and nondestructive testing of structural steel elements in buildings, structures and portions thereof shall be in accordance with the quality assurance inspection requirements of AISC 360.

3.2.2 Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck shall be in accordance with the quality assurance inspection requirements of the Steel Deck Institute QA/QC.

3.2.3 Special inspections of open-web steel joists and joist girders in buildings, structures and portions thereof shall be in accordance with Attachment **01** (2015 IBC Table 1705.2.3).

3.3 CONCRETE CONSTRUCTION

Special inspections and tests of concrete construction shall be performed in accordance with Attachment **02** (2015 IBC Table 1705.3).

3.4 MASONRY CONSTRUCTION

Special inspections and tests of masonry construction shall be performed in accordance with the quality assurance requirements of TMS 402/ACI 530/ASCE 5 and TMS 602/ACI 530.1/ASCE 6.

3.5 SOILS

Special inspections and tests of existing site soil conditions, fill placement and load-bearing requirements shall be performed in accordance with Attachment **03** (2015 IBC Table 1705.6).

The approved geotechnical report and the construction documents prepared by the registered design professionals shall be used to determine compliance. During fill placement, the special inspector shall verify that proper materials and procedures are used in accordance with the provisions of the approved geotechnical report.

3.6 DRIVEN DEEP FOUNDATIONS

Special inspections and tests shall be performed during installation of driven deep foundation elements as specified in Attachment **04** (2015 IBC Table 1705.7). NOT APPLICABLE TO THIS PROJECT.

The approved geotechnical report and the construction documents prepared by the registered design professionals shall be used to determine compliance.

3.7 CAST-IN- PLACE DEEP FOUNDATIONS

Special inspections and tests shall be performed during installation of cast-in-place deep foundation elements as specified in Attachment **05** (2015 IBC Table 1705.8).

The approved geotechnical report and the construction documents prepared by the registered design professionals shall be used to determine compliance.

3.8 WOOD CONSTRUCTION – NOT APPLICABLE TO THIS PROJECT

3.9 HELICAL PILE FOUNDATIONS – NOT APPLICABLE TO THIS PROJECT

3.10 SPECIAL INSPECTIONS FOR WIND RESISTANCE – Periodic special inspection shall be performed during installation of roof covering, roof deck and roof framing connections, exterior wall covering, wall connections to roof and floor diaphragms and framing in accordance with the quality assurance requirements of 2015 IBC Sections 1705.11.3.

3.11 SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE – Special inspection shall be performed during installation of structural steel and structural steel elements in the seismic force-resisting systems of buildings in accordance with the quality assurance requirements of AISC 341 (2015 IBC Sections 1705.12.1.1 and 1705.12.1.2).

3.12 TESTING FOR SEISMIC RESISTANCE – Special testing shall be performed during installation of structural steel and structural steel elements in the seismic force-resisting systems of buildings in accordance with the quality assurance requirements of AISC 341 (2015 IBC Sections 1705.12.1.1 and 1705.12.1.2).

3.13 SPRAYED FIRE-RESISTANT MATERIALS – NOT APPLICABLE TO THIS PROJECT

3.14 MASTIC AND INTUMESCENT FIRE-RESISTANT COATINGS – NOT APPLICABLE TO THIS PROJECT

3.15 EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS) – NOT APPLICABLE TO THIS PROJECT

3.16 FIRE-RESISTANT PENETRATIONS AND JOINTS – NOT APPLICABLE TO THIS PROJECT

3.17 TESTING FOR SMOKE CONTROL – NOT APPLICABLE TO THIS PROJECT

4 DESIGN STRENGTHS OF MATERIALS

4.1 Conformance to standards. The design strengths and permissible stresses of any structural material that are identified by a manufacturer's designation as to manufacture and grade by mill tests, or the strength and stress grade is otherwise confirmed to the satisfaction of the AHJ, shall conform to the specifications and methods of design of accepted engineering practice or the approved rules in the absence of applicable standards.

4.2 New materials. For materials that are not specifically provided for in the 2015 IBC, the design strengths and permissible stresses shall be established by tests provided for in Chapter 17, 2015 IBC. These tests include but are not limited to alternative test procedures, in-situ load tests, and preconstruction load tests.

2.ATTACHMENTS

Attachment **01**: Required Special Inspections of Open-web Steel Joists and Joist Girders (Note: IBC no longer contains a list of required special inspections for structural steel, instead it references AISC 360)

Attachment **02**: Required Special Inspections and Tests of Concrete Construction

Attachment **03**: Required Special Inspections and Tests of Soils

Attachment **04**: Required Special Inspections and Tests of Driven Deep Foundation Elements NOT APPLICABLE TO THIS PROJECT

Attachment **05**: Required Special Inspections and Tests of Cast-In-Place Deep Foundation Elements

Attachment **06**: Statement of Special Inspections

Attachment **07**: Contractor’s Statement of Responsibility

Attachment **08**: Fabricator’s Certificate of Compliance

Attachment **09**: Final Report of Special Inspections

END OF SECTION

ATTACHMENT 01
2015 IBC TABLE 1705.2.3
REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

Note – for Structural Steel, Special inspections shall be in accordance with the quality assurance inspection requirements of AISC 360, Chapter N, specifically tables N5.4-1 through 3, N5.6-1 through 3, and N6.1. IBC no longer contains a table of required special inspections for Structural Steel. Refer to AISC 360.

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]
1. Installation of open-web steel joists and joist girders.			
a. End connections – welded or bolted.	—	X	SJI specifications listed in Section 2207.1.
b. Bridging – horizontal or diagonal	—		
1. Standard bridging.	—	X	SJI specifications listed in Section 2207.1.
2. Bridging that differs from the SJI specifications listed in Section 2207.1.		X	

a. Where applicable, see also Section 1705.12, Special inspections for seismic resistance.

ATTACHMENT 02
2015 IBC TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD*	IBC REFERENCE
1. Inspect reinforcement, including prestressing tendons, and verify placement.	___	X	ACI 318 Ch. 20, 25.2, 25.3, 26.5.1 – 26.5.3	1908.4
2. Reinforcing bar welding:				
a. Verify weldability of reinforcing bars other than ASTM A706;	___	X	AWS D1.4	
b. Inspect single-pass fillet welds, maximum 5/16"; and		X	ACI 318: 26.5.4	___
c. Inspect all other welds.	X			
3. Inspect anchors cast in concrete.	___	X	ACI 318: 17.8.2	___
4. Inspect anchors post-installed in hardened concrete members.[b]				
a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension loads.	X		ACI 318: 17.8.2.4	___
b. Mechanical anchors and adhesive anchors not defined in 4.a.		X	ACI 318: 17.8.2	
5. Verify use of required design mix.	___	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2, 1908.2, 1908.3
6. Prior to concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	X	___	ASTM C172 ASTM C31 ACI 318: 26.4.5, 26.12	1908.10
7. Inspect concrete and shotcrete placement for proper application techniques.	X	___	ACI 318: 26.4.5	1908.6, 1908.7, 1908.8
8. Verify maintenance of specified curing temperature and techniques.	___	X	ACI 318: 26.4.7 – 26.4.9	1908.9
9. Inspect pre-stressed concrete for:				
a. Application of prestressing forces; and	X	___	ACI 318: 26.9.2.1	___
b. Grouting of bonded prestressing tendons.	X	___	ACI 318: 26.9.2.3	
10. Inspect erection of precast concrete members.	----	X	ACI 318: Ch. 26.8	___
11. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.	___	X	ACI 318: 26.10.2	___
12. Inspect formwork for shape, location and dimensions of the concrete member being formed.	___	X	ACI 318: 26.10.1 (b)	___

a. Where applicable, see also Section 1705.12, Special inspections for seismic resistance.
b. Specific requirements for special inspection shall be included in the research report for the anchor issued by an approved source in accordance with 17.8.2 in ACI 318, or other qualification procedures. Where specific requirements are not provided, special inspection requirements shall be specified by the registered design professional and shall be approved by the building official prior to the commencement of the work.

ATTACHMENT 03
2015 IBC TABLE 1705.6
REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	___	X
2. Verify excavations are extended to proper depth and have reached proper material.	___	X
3. Perform classification and testing of compacted fill materials.	___	X
4. Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill.	X	___
5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	___	X

ATTACHMENT 04
2015 IBC TABLE 1705.7
REQUIRED SPECIAL INSPECTIONS AND TESTS OF DRIVEN DEEP FOUNDATION ELEMENTS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Verify element materials, sizes and lengths comply with the requirements.	X	___
2. Determine capacities of test elements and conduct additional load tests, as required.	X	___
3. Inspect driving operations and maintain complete and accurate records for each element.	X	___
4. Verify placement locations and plumbness, confirm type and size of hammer, record number of blows per foot of penetration, determine required penetrations to achieve design capacity, record tip and butt elevations and document any damage to foundation element.	X	___
5. For steel elements, perform additional special inspections in accordance with Section 1705.2.	___	___
6. For concrete elements and concrete-filled elements, perform tests and additional special inspections in accordance with Section 1705.3.	___	___
7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge.	___	___

ATTACHMENT 05
2015 IBC TABLE 1705.8
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CAST-IN-PLACE DEEP FOUNDATION ELEMENTS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1. Inspect drilling operations and maintain complete and accurate records for each element.	X	___
2. Verify placement locations and plumbness, confirm element diameters, bell diameters (if applicable), lengths, embedment into bedrock (if applicable) and adequate end- bearing strata capacity. Record concrete or grout volumes.	X	___
3. For concrete elements, perform tests and additional special inspections in accordance with Section 1705.3.	___	___

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

PROJECT:
LOCATION:
PERMIT APPLICANT:
APPLICANT'S ADDRESS:
ARCHITECT OF RECORD:
STRUCTURAL ENGINEER OF RECORD:
REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE:

This Statement of Special Inspections is submitted in accordance with Section 1704 of the 2015 International Building Code. It includes a *Schedule of Special Inspection Services* applicable to the above-referenced Project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections. If applicable, it includes *Requirements for Seismic Resistance* and/or *Requirements for Wind Resistance*.

Are *Requirements for Seismic Resistance* included in the *Statement of Special Inspections*?	☒ Yes	☐ No
Are *Requirements for Wind Resistance* included in the *Statement of Special Inspections*?	☐ Yes	☒ No

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Building Official and to the Registered Design Professional in Responsible Charge at a frequency agreed upon by the Design Professional and the Building Official prior to the start of work. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the Building Official and the Registered Design Professional in Responsible Charge prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and corrections of any discrepancies noted in the inspections shall be submitted to the Building Official and the Registered Design Professional in Responsible Charge at the conclusion of the project.

Frequency of interim report submittals to the Registered Design Professional in Responsible Charge:

__Weekly __Bi-Weekly __Monthly Other; specify:_____

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

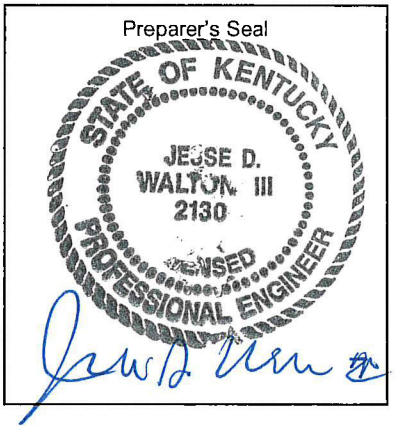
Statement of Special Inspections Prepared by:

Jesse D. Walton III

Type or print name

Signature 5-21-2021 Date

Preparer's Seal



Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

Building Official's Acceptance:

_____

Signature Date

_____

Permit Number:

Frequency of interim report submittals to the Building Official:

__Monthly __Bi- Monthly __Upon Completion Other; specify:_____

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

REQUIREMENTS FOR SEISMIC RESISTANCE

See the Schedule of Special Inspections for inspection and testing requirements, if applicable

Seismic Design Category: D

Statement of Special Inspection for Seismic Resistance Required (Yes/No): Yes

Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:

- The structural system for the Absorber Access Tower Frame and Outlet Support Steel Frame shall be "Steel Ordinary Concentrically Braced Frame with Permitted Height Increase" per ASCE 7-10 Table 15.4-1.
- The structural system for the Inlet Support Steel Frame shall be "Steel Ordinary Concentrically Braced Frame with Unlimited Height" per ASCE 7-10 Table 15.4-1.
- The structural system for the Pre-engineered Metal Buildings shall be "Steel Ordinary Moment Frames with Unlimited Height" per ASCE 7-10 Table 15.4-1.
- The structural system for other structures shall be "Steel Ordinary Concentrically Brace Frame with Unlimited Height" per ASCE 7-10 Table 15.4-1.

Description of designated seismic systems subject to special inspection and testing for seismic resistance: LATER

(Consideration required for structures assigned to Seismic Design Category C, D, E or F per 2015 IBC Section 1705.12.)

Description of additional seismic systems and components requiring special inspections and testing: LATER

(Consideration required for structures assigned to Seismic Design Category B, C, D, E or F or for seismic isolation systems in seismically isolated structures per 2015 IBC Section 1705.12)

Statement of Responsibility:

(Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.)

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS
REQUIREMENTS FOR WIND RESISTANCE

See the Schedule of Special Inspections for inspection and testing requirements, if applicable

Strength-Level Wind Speed (3 second gust): 120 mph
Service-Level Wind Speed (3 second gust, V_{asd}): 93 mph

Wind Exposure Category:

Statement of Special Inspection for Wind Resistance Required (Yes/No): No
(Required in wind exposure Category B, where the service-level wind speed (V_{asd}) is 120 miles per hour or greater. Required in wind exposure Category C or D, where the service-level wind speed (V_{asd}) is 110 miles per hour or greater)

Description of main wind force-resisting system subject to special inspection for wind resistance:

Not Applicable

Description of wind force-resisting components subject to special inspection for wind resistance:

Not Applicable

Statement of Responsibility:

(Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.)

Not Applicable

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

SCHEDULE OF INSPECTION AND TESTING AGENCIES

This Statement of Special Inspections / Quality Assurance Plan includes the following building systems:

- ☒ Soils and Earthwork
- ☒ Cast-in-Place Concrete
- ☐ Masonry
- ☒ Structural Steel
- ☐ Cold-Formed Steel Framing
- ☐ Spray Fire Resistant Material
- ☐ Wood Construction
- ☐ Exterior Insulation and Finish System
- ☐ Mechanical & Electrical Systems
- ☐ Architectural Systems
- ☐ Special Cases

Special Inspection Agencies	Firm	Address, Telephone, e-mail
1. Special Inspection Coordinator	TBD	
2. Special Inspector (Soils and Earthwork)	TBD	
3. Special Inspector (Cast-In-Place Concrete)	TBD	
4. Special Inspector (Masonry)	TBD	
5. Special Inspector (Structural Steel)	TBD	
6. Testing Agency	TBD	
7. Structural Observation (Engineer of Record)	TBD	

Note: The inspectors and testing agencies shall be engaged by the Owner or the Owner's Representative, and not by the Contractor or Subcontractor whose work is to be inspected or tested. Any conflict of interest must be disclosed to the Building Official, prior to commencing work.

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

QUALIFICATIONS OF INSPECTORS AND TESTING TECHNICIANS

The qualifications of all personnel performing Special Inspection and testing activities are subject to the approval of the Building Official. The credentials of all Inspectors and testing technicians shall be provided if requested.

Key for Minimum Qualifications of Inspection Agents:

When the Registered Design Professional in Responsible Charge deems it appropriate that the individual performing a stipulated test or inspection have a specific certification or license as indicated below, such designation shall appear below the *Agency Number* on the Schedule.

AE/PE	Registered Architect or licensed PE specializing in the design of building structures
PE/GE	Geotechnical Engineer – a licensed PE specializing in soil mechanics, foundations
EIT	Engineer-In-Training – a graduate engineer who has passed the Fundamentals of Engineering examination

American Concrete Institute (ACI) Certification

ACI-CFTT	Concrete Field Testing Technician – Grade 1
ACI-CCI	Concrete Construction Inspector
ACI-LTT	Laboratory Testing Technician – Grade 1&2
ACI-STT	Strength Testing Technician

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector
AWS/AISC-SSI	Certified Structural Steel Inspector

American Society of Non-Destructive Testing (ASNT) Certification

ASNT	Non-Destructive Testing Technician – Level II or III.

International Code Council (ICC) Certification

ICC-SMSI	Structural Masonry Special Inspector
ICC-SWSI	Structural Steel and Welding Special Inspector
ICC-SFSI	Spray-Applied Fireproofing Special Inspector
ICC-PCSI	Pre-stressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector

National Institute for Certification in Engineering Technologies (NICET)

NICET-CT	Concrete Technician – Levels I, II, III & IV
NICET-ST	Soils Technician - Levels I, II, III & IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III & IV

Exterior Design Institute (EDI) Certification

EDI-EIFS	EIFS Third Party Inspector

Other

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

Structural Steel & Miscellaneous Steel (See Attachment 01, 2015 IBC Table 1705.2.3 for open-web steel joists and joist girders, see AISC 360 Chapter N for structural steel)

Item	Agency # (Qualif.)	Scope
1. Fabricator Certification/ Quality Control Procedures ☐ Fabricator Exempt	Later (AWS/AISC-SSI ICC-SWSI)	Review shop fabrication and quality control procedures.
2. Material Certification	Later (AWS/AISC-SSI ICC-SWSI)	Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts and welding electrodes
3. Open Web Steel Joists	N/A (AWS/AISC-SSI ICC-SWSI)	Inspect installation, field welding and bridging of joists.
4. Bolting	Later (AWS/AISC-SSI ICC-SWSI)	Inspect installation and tightening of high-strength bolts. Verify compliance with AISC 360 Chapter N.
5. Welding	Later (AWS-CWI ASNT)	Visually inspect all welds. Inspect pre-heat, post-heat and surface preparation between passes. Verify size and length of fillet welds. Ultrasonic testing of all full-penetration welds. Verify compliance with AISC 360 Chapter N.
6. Shear Connectors	N/A (AWS/AISC-SSI ICC-SWSI)	Inspect size, number, positioning and welding of shear connectors. Inspect studs for full 360 degree flash. Ring test all shear connectors with a 3 lb hammer. Bend test all questionable studs to 15 degrees.
7. Structural Details	Wood (PE)	Inspect steel frame for compliance with structural drawings, including bracing, member configuration and connection details.
8. Metal Deck	Later (AWS/AISC-SSI)	Inspect powder-actuated fasteners and side-lap fastening screws for metal roof deck.

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

Cast-in-Place Concrete (See Attachment 02, 2015 IBC Table 1705.3)

Item	Agency #	Scope
1. Mix Design	Later (ACI-CCI ICC-RCSI)	Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.
2. Material Certification	Later (ACI-CCI ICC-RCSI)	Verify material certifications are in conformance with appropriate mix design.
3. Reinforcement Installation	Later (ACI-CCI ICC-RCSI)	Inspect size, spacing, cover, positioning and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters
4. Post-Tensioning Operations (Not Applicable on this project)	NA (ACI-CCI ICC-RCSI)	Inspect placement, stressing, grouting and protection of post-tensioning tendons. Verify that tendons are correctly positioned, supported, tied and wrapped. Record tendon elongations.
5. Welding of Reinforcing, if any	Later (ACI-CCI ICC-RCSI)	Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.
6. Anchor Rods	Later (ACI-CCI ICC-RCSI)	Inspect size, positioning and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.
7. Concrete Placement	Later (ACI-CCI ICC-RCSI)	Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated.
8. Sampling and Testing of Concrete	Later (ACI-CCI ICC-RCSI)	Test concrete compressive strength (ASTM C31 & C39), slump (ASTM C143), air-content (ASTM C173 or C231) and temperature (ASTM C1064).
9. Curing and Protection	Later (ACI-CCI ICC-RCSI)	Inspect curing, cold weather protection and hot weather protection procedures.
10. Post Installed Anchors	Later (ACI-CCI ICC-RCSI)	Inspect installation in accordance with manufacturer's instructions and in accordance with ICC legacy reports

Attachment 06

STATEMENT OF SPECIAL INSPECTIONS

Soils and Earthwork (See Attachment 03, 2015 IBC Table 1705.6)

Item	Agency #	Scope
1. Shallow Foundation Subgrade	Later (PE/GE)	1. Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report. 2. Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill.
2. Controlled Structural Fill	Later (PE/GE)	1. Perform sieve tests (ASTM D422 & D1140) and Modified Proctor tests (ASTM D1557) for each source of fill material. 2. Inspect placement, lift thickness and compaction of controlled fill. 3. Test density of each lift of fill by nuclear methods (ASTM D6938) or sand-cone method (ASTM D1556). 4. Verify extent and slope of fill placement.

Attachment 07

CONTRACTOR'S STATEMENT OF RESPONSIBILITY

Each contractor responsible for the construction or fabrication of a main wind or seismic force-resisting system, designated seismic system or wind or seismic-resisting component listed in the Statement of Special Inspections, Requirements for Seismic or Wind Resistance, must submit a Statement of Responsibility.

Project: D.B. Wilson Station FGD Retrofit Project

Contractor's Name: _____

Address: _____

License No.: _____

Description of building systems and components included in Statement of Responsibility:

_____

_____

_____

_____

_____

Contractor's Acknowledgement of Special Requirements

I hereby acknowledge that I have received, read, and understand the Statement of Special Inspections and Special Inspection program:

I hereby acknowledge that control will be exercised to obtain conformance with the approved construction documents.

_____

Name and Title (type or print)

_____ _____

Signature Date

Contractor's Provisions for Quality Control

Procedures for exercising control within the contractor's organization, the method and frequency of reporting and distribution of reports is attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Attachment 08

FABRICATOR'S CERTIFICATE OF COMPLIANCE

Each approved fabricator that is exempt from Special Inspection of shop fabrication and implementation procedures per section 1704.2.5.1 of the 2015 International Building Code must submit *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project: D.B. Wilson Station FGD Retrofit Project

Fabricator's Name:

Address:

Certification or Approval Agency: _____

Certification Number: _____

Date of Last Audit or Approval: _____

Description of structural members and assemblies that have been fabricated:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

_____
Name and Title (type or print)

_____ _____
Signature Date

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

Attachment 09

FINAL REPORT OF SPECIAL INSPECTIONS

PROJECT: D.B. Wilson Station FGD Retrofit Project

LOCATION: Centertown, KY

PERMIT APPLICANT:

APPLICANT'S ADDRESS:

ARCHITECT OF RECORD:

STRUCTURAL ENGINEER OF RECORD: Jesse D. Walton III

REGISTERED DESIGN PROFESSIONAL IN RESPONSIBLE CHARGE:

To the best of my information, knowledge, and belief, which are based upon observations or diligent supervision of our inspection services for the above-referenced Project, I hereby state that the special inspections or testing required for this Project, and designated for this Agent in the *Schedule of Special Inspection Services*, have been completed in accordance with the Contract Documents.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Interim reports submitted prior to this final report and numbered___to___form a basis for, and are to be considered an integral part of this final report. The following discrepancies that were outstanding since the last interim report dated _____ have been corrected:

_____

_____

_____

_____

(Attach 8 ½"x11" continuation sheet(s) if required to complete the description of corrections)

Prepared By:

_____
Special Inspection Agent/Firm

_____
Type or print name

_____
Signature Date

Big Rivers
ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix E – Rev 2

Architectural Specifications

(New Documents/Revisions are Denoted by ____ *)

Appendix	Document Number	Document Title	Document Revision
E	143993-ASA-DD3-SPC-1501	THERMAL INSULATION - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1502	INSULATED CORE METAL ROOF PANEL - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1503	INSULATED CORE METAL WALL PANEL - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1504	SHEET METAL FLASHING AND TRIM - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1505	FIRESTOPPING - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1506	OVERHEAD COILING DOORS - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1507	DOOR HARDWARE - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1508	JOINTS AND SEALANTS - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1509	HOLLOW METAL DOORS AND FRAMES - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1510	PAINTING AND COATING - CONSTRUCTION SPECIFICATION	0
~~E~~	~~143993-ASA-DD3-SPC-1511~~	~~ELECTRIC HEAT TRACING SYSTEM FOR GUTTERS - CONSTRUCTION SPECIFICATION~~	VOIDED/REMOVED
E	143993-ASA-DD3-SPC-1512	METAL BUILDING SYSTEMS - CONSTRUCTION SPECIFICATION	0
E	143993-ASA-DD3-SPC-1513	CONCRETE UNIT MASONRY - CONSTRUCTION SPECIFICATION	0
~~E~~	~~143993-ASA-DD3-SPC-1514~~	~~RESINOUS FLOORING - CONSTRUCTION SPECIFICATION~~	VOIDED/REMOVED

CONSTRUCTION SPECIFICATION

TITLE:	THERMAL INSULATION	PROJECT DOC. NO.:	143993-ASA-DD3-SPC-1501	REV.	0

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 072100

THERMAL INSULATION

1.0 GENERAL

1.1. SCOPE

Work under this section includes all materials, labor, equipment and services for thermal insulation and vapor retarders in accordance with the Drawings, Construction Specifications and Scope of Work Document.

1.2. PUBLICATIONS REFERENCED HEREIN

1.2.1. Referenced publications within this Specification shall be the latest revision, unless otherwise specified; and applicable parts of the referenced publications shall become a part of this Specification as if fully included.

1.2.1.1. 2018 Kentucky Building Code (KBC)

1.2.1.2. International Energy Conservation Code, 2012 (IECC)

1.2.1.3. ASHRAE 90.1 2010

1.2.1.4. Occupational Safety and Health Administration (OSHA)

- ASHRAE – American Society of Heating, Refrigeration and Air Conditioning Engineers: 90.1 – Energy Standard for Buildings except Low-Rise Residential Buildings
- American Society for Testing and Materials (ASTM), current edition of the following standards:
  - *C665 – Standard Specifications for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing*
  - *C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board*
  - *C1303 Standard Test for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation*
  - *C1320 – Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction*
  - *C11696-16 Standard Guide for Industrial Thermal Insulation Systems*
  - *D3310 – Standard Test Method for Determining Corrosivity of Adhesive Materials*
  - *D3575-00e1: Standard Test Methods for Flexible Cellular Materials made from Olefin Polymers.*
  - *E84 – Standard Test Method for Surface Burning Characteristics of Building Materials*
  - *E96 – Standard Test Methods for Water Vapor Transmission of Materials*
  - *E119 – Standard Test Methods for Fire Tests of Building Construction and Materials*

- *E 136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750-Degree Celsius D1056-00: Specifications for Flexible Cellular Materials - Sponge or Expanded Rubber.*

- Underwriters Laboratories, Inc. (U.L.), Building Materials Directory and Labeling Service

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's product data indicating density, R-value and installation instructions for each material and product used.

B. Submit for approval test reports performed by a qualified independent testing laboratory evidencing compliance of insulation products with requirements including R-values and fire performance.

1.4 DESIGN REQUIREMENTS

Provide necessary engineering to ensure proper thermal resistivity (R-values) required for the building or facility enclosure per Governing Code, ASHRAE 90.1 and IECC.

The 2012 IECC requires R-13 plus R-13 of continuous insulation for metal building wall insulation in Climate Zone 4A.

The 2012 IECC requires R-19 plus R-11 in the form of a continuous liner system, with thermal break blocks at the purlins, for metal building roof insulation in Climate Zone 4A.

1.5 PERFORMANCE REQUIREMENTS

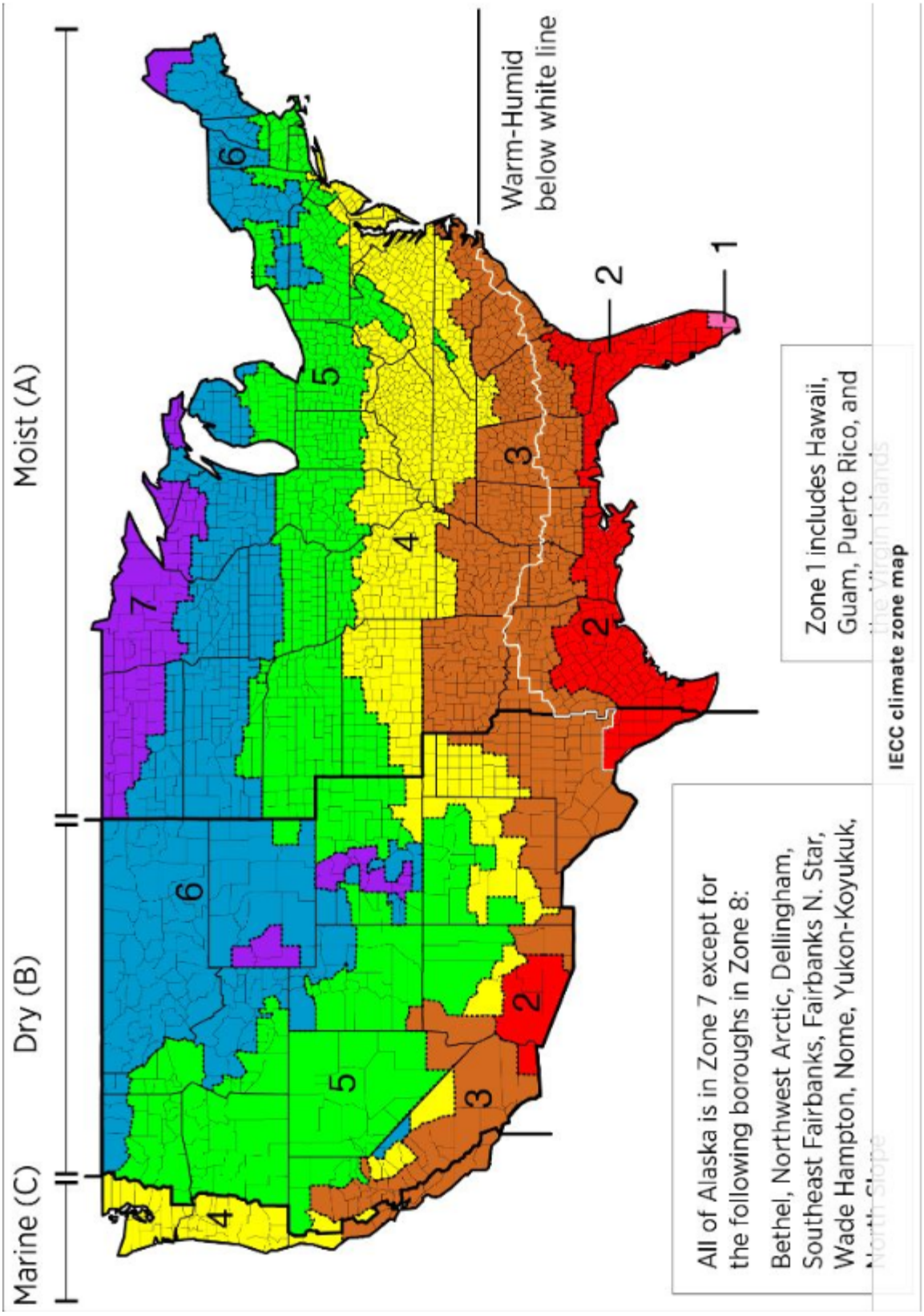
Building insulation of each type shall be obtained through one source.

Surface-burning characteristics: ASTM E84, U.L. 723, and as follows:

1. Flame-Spread Index: 25 or less
2. Smoke-Developed Index: 450 or less

1.6 QUALITY ASSURANCE

Comply with governing codes and regulations. Provide products of acceptable manufacturers, which have been in satisfactory use in similar service for three years. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions.


Warm-Humid
below white line
Moist (A)
Dry (B)
Marine (C)
Zone 1 includes Hawaii,
Guam, Puerto Rico, and
All of Alaska is in Zone 7 except for
the following boroughs in Zone 8:
Bethel, Northwest Arctic, Dellingham,
Southeast Fairbanks, Fairbanks N. Star,
Wade Hampton, Nome, Yukon-Koyukuk,
IECC climate zone map

2.0 PRODUCTS

2.1 MATERIALS

A. Mineral fiber rigid board insulation: The basis of design shall be ComfortBoard CIS supplied by Innovative Metals Company, Inc. (IMETCO), Norcross, GA

1. Alternate products are subject to demonstrate full compliance with Specifications' requirements, and must submit for approval Manufacturer's literature; certification of testing in accordance with noted standards' requirements and this Specification; sample warranties in accordance with this Specification; installer qualifications in accordance with this Specifications, and a list of five (5) similar projects in size and scope of work.

2. Material: Basalt rock and slag mineral fiber board insulation, Type IV-B in accordance with ASTM C612.
3. Thickness: 2 inch thickness (1 layer)
4. Insulation board size shall be 48-inches x 48-inches
5. R-VALUE: Provide R-values as indicated on the Drawings, or at a minimum as required to meet IECC, as referenced.

B. POLYISOCYANURATE FOAM ROOFING AND WALL INSULATION

1. Insulation shall be a closed-cell, polyisocyanurate foam core with factory-laminated facers conforming to ASTM Specification C 1289, Type II. Foam is to be manufactured using HCFC blowing agent. Foam core is to have a rated flame spread of 25 or less and minimum compressive strength of 25 psi according to ASTM C165 or D1621. Insulation shall be supplied in 4' x 8' boards. Insulation is to be flat stock 2" thick.
2. R-VALUE: Provide R-values as indicated on the Drawings, or at minimum as required to meet IECC, as referenced.
3. Provide products as manufactured by one of the following:
    - Pyrox by Apache Product Co.
    - AC Foam II by Atlas Roofing Corp.
    - ENRGY 3 by Johns Manville Roofing Systems Group.
    - ISO 95+ by Firestone
    - Specified roof membrane manufacturer supplied approved equal

C. TAPERED POLYISOCYANURATE FOAM ROOFING INSULATION

1. Insulation shall be a closed-cell, polyisocyanurate foam core with factory-laminated facers conforming to ASTM Specifications C1289, Type II. Foam shall be manufactured using HCFC blowing agent. Foam core is to have a rated flame spread of 25 or less and minimum compressive strength of 25 psi according to ASTM C165 or D1621. Insulation to have a minimum slope of 1/2 inch per foot. Insulation is to be supplied in 4' x 4' boards. Insulation to be a minimum 0.5 inch thick.
2. Provide products as manufactured by one of the following:
    - AC Foam II by Atlas Roofing Corp.
    - ENRGY 3 by Johns Manville Roofing Systems Group.
    - ISO 95+ by Firestone

- Specified roof membrane manufacturer supplied approved equal

D. EXTRUDED POLYSTYRENE BOARD INSULATION

1. For use under concrete slabs, at foundations, and exterior walls, per Table C402.1.3 in the International Energy Conservation Code.
2. Manufacturer: Dow XPS, CertainTeed Corp. Insulation Group; Hunter Panels; Insulfoam, a Carlisle Company; Knauf Insulation
3. Provide R-values as indicated on the Drawings, or at minimum as required to meet IECC, as referenced.
4. Type: Extruded polystyrene, rigid.
    a. Standard: ASTM C578.

E. GLASS FIBER FACED BLANKET INSULATION:

1. Manufacturer: Owens Corning, Johns Manville, Knauf Insulation, CertainTeed Corp. Insulation Group, or approved equivalent product.
2. Glass Fiber Face Blanket Insulation: ASTM C991, TYPE I, Class A; foil-scrim-kraft or foil-scrim-polypropylene vapor-retarded membrane on one face.
3. Facing Perm Rating: 0.02
4. Flanged Units: Blankets fabricated with facing incorporating 4-inch wide flange along their edges for attachment to framing members.

F. SELF-ADHERING VAPOR PERMEABLE AIR AND WATER BARRIER

1. General: Obtain all primary air barrier components and accessories from the same supplier to ensure total system compatibility and integrity.
2. Air Barrier Membrane Materials.
    a. The basis of design shall be IntelliWrap SA by Innovative Metals Company, Inc. (IMETCO), Norcross, GA 843-437-8632.
    b. Alternate suppliers are subject to full compliance with Specification's requirements. Equivalent products by Carlisle, Soprema, Dow Corning, or other submitted, approved manufacturer.
    c. Material: Multi-layer UV stabilized self-adhering vapor permeable sheet membrane comprised of two high-strength, spun-bonded polypropylene fabric outer layers thermally bonded to a highly vapor permeable, watertight polymeric middle layer.
        i. Weight: 40 lbs per roll.
        ii. Allowable UV Exposure: 50 days.
        iii. Application Temperature: Ambient temperature must be above 40 ºF
        iv. Service Temperature: -40 ºF to 176 ºF
        v. Roll Dimensions: 59 inches wide by 115 feet long.
3. Air Barrier Transition and Flashing Membrane.
    a. Transition and flashing air barrier membrane shall be IntelliWrap Flashing SA by IMETCO, a self-adhering, water-resistive, vapor permeable membrane flashing sheet with properties the same as those of the Air Barrier Membrane.

b. Roll Dimensions: 4 inches or 9 inches wide by 75 feet long.

4. Air Barrier Flashing and Penetration Tapes: Tapes shall be IntelliWrap Tape by IMETCO, a UV stabilized double or single sided moisture-resistant flexible tape with adhesive backing having the following characteristics:

   a. IntelliWrap Tape Single-Sided: 2.5 inches wide penetration seam tape.

5. Preformed Window and Door Corners: Preformed window and door flashing membrane shall be IntelliWrap SA Factory Formed Corners by IMETCO, an 18-inch by 18-inch preformed 90º inside corner membrane with the same vapor permeance, resistance to air leakage, and physical properties as the primary air barrier membrane.

3.0 EXECUTION

3.1 INSTALLATION

A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction. Coordinate with work of other sections. Provide full thickness in one layer over entire area, tightly fitting around penetrations.

B. Seal all seams and around perimeter and penetrations with duct tape to form a continuous vapor retarder free of holes.

C. Protect installed insulation.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**INSULATED CORE METAL ROOF PANEL**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1502**	REV. **0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 074116

INSULATED CORE METAL ROOF PANEL

1.0 GENERAL

1.1 SECTION INCLUDES

The work under this section includes all materials, labor, equipment and services for foamed-insulation-core metal roof panel assembly in accordance with the Drawings, Construction Specifications, and Scope of Work Documents.

1.2 PUBLICATIONS REFERENCED HEREIN

- AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtainwalls and Sloped Glazing Systems.
- AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- AAMA 621 - Voluntary Specification for High Performance Organic coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ASTM A755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- ASTM C920 - Specification for Elastomeric Joint Sealants.
- ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
- ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- ASTM E84 - Test Methods for Surface Burning Characteristics of Building Materials.
- ASTM E119 - Test Methods for Fire Tests of Building Construction and Materials.
- ASTM E283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
- ASTM E330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

- ANSI/FMG 4880 Standard for Evaluating Insulated Wall & Roof/Ceiling Assemblies.
- UL 263 - Fire Tests of Building Construction and Materials.
- UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

1.3.1 General: Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

1.3.2 Air Infiltration: Maximum 0.023 cfm/sq. ft. (0.115 L/s per sq. m) per ASTM E1680 at a static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).

1.3.3 Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E1646 at a minimum static differential pressure of 20 lbf/sq. ft. (958 Pa).

1.3.4 Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E72:

- Wind loads: Basic Wind Speed = 120 mph (nominal design 3-second gust wind speed at 33 ft above ground for Exposure C category, ASCE 7-10, Chapters 26-30, Risk Category III
- Roof panel Uplift Testing: Certify capacity of metal panels by testing of proposed assembly per ASTM E1592 or FM 4474
- Snow Loads:
- Ground Snow Load, p_g: 15 psf (2015 IBC Chap. 16, 2018 KBC Section 1608/ASCE 7-10 Chap 7
- Snow Importance Factor, I: 1.10 (Risk Category III)
- Deflection Limits: Withstand test pressures of 150 percent of inward and outward wind-load design pressures with maximum deflection of 1/180 of the span with no evidence of failure.

1.3.5 Seismic Performance: Provide metal roof panel assemblies capable of withstanding the effects of earthquake motions in accordance with the seismic design criteria as outlined in the Kentucky Building Code for the area in which the building is located.

1.3.6 Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

1.3.7 Thermal Performance: Thermal-resistance (R) value of R25, per ASTM C1363, corrected to 15 mph wind outside and still air inside. Thermal performance listed is a minimum and shall be higher if required by the IECC current edition.

1.3.8 Fire Performance Characteristics: Provide metal roof systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1.3.9 Surface-Burning Characteristics: Provide metal wall system panels with the following characteristics when tested per ASTM E84.

- Flame spread index: 25 or less.
- Smoke developed index: 450 or less.
- Fire Performance of Insulated Roof: Class 1 roof panel per ANSI/FM 4880.

1.3.10 Roof Panels FM Approvals Listing: Comply with FM Approvals 4471 as part of a panel roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 construction.

- Fire/Windstorm Classification: Calls 1A-90
- Hail Resistance Rating: SH

1.3.11 Insulating Core: Polyurethane with zero ozone depletion potential blowing agent.

- Closed Cell Content: 90% or more as determined by ASTM D6226
- Compressive Strength: As required to meet structural performance requirements and with a minimum of 15 psi as determined by ASTM D1621
- Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D1622

1.3.12 SUBMITTALS

- Product Data: Manufacturer's data sheets for specified products.
- Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details at a minimum scale 1-1/2-inch per foot of all required trim and extrusions needed for a complete installation. Shall show placement of all roof accessories to be installed on roof surface including, snow guards and fall protection.
- Samples for Initial Selection: For each product specified including sealants and gaskets. Provide two color samples to Architect for review and approval prior to fabrication.
- Samples for Verification: Provide 12-inch- (305 mm-) long section of metal wall panel showing finishes, vertical joint return, injected core material, and anchoring details. Provide 12-inch- (305 mm-) long pieces of each extruded aluminum trim and gaskets.
- Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.
- Coordination Drawings: Layout drawings and detail drawings coordinating the installation of wall and roof panels with purlins, and other secondary framing. Coordinate penetrations, openings, and mechanical attachments.
- Qualification Information: For Installer firm and Installer's field supervisor.
- Manufacturer's warranty: Submit sample warranty.
- Maintenance data.

1.3.13 WARRANTY

1.3.13.1 Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

1.3.13.2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.3.13.3 Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

2.0 PRODUCTS

2.1 MANUFACTURER

MetlSpan is named for the purpose of establishing acceptable standards of form and quality. Equivalent reviewed products of other manufacturers may be used for the project.

2.2 GENERAL

All materials used shall be subject to review. Provide metal system meeting performance requirements as determined by application of specified tests by a qualified testing facility on manufacturer's standard assemblies.

2.3 WIND LOADING

The installed system shall comply with the requirements of the 2018 Kentucky Building Code (KBC) for wind loads at the specific installed heights of the siding above ground level without deflecting more than 1/120 of the girt span shown on the Drawings.

2.4 METAL SHEETS

Metal sheets for material hereinafter specified shall consist of Aluminum-Zinc Alloy-Coated Steel Sheets, ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 pre-painted by the coil-coating process per ASTM A755/A755M, finish as specified.

2.5. METAL ROOF PANEL

Roof panel shall be MetlSpan's CFR Standing Seam, Foamed-Insulation-Core Metal Roof Panel, concealed fastener system. Color shall be as selected by the Owner.

2.6. Exterior Face Sheet: MetlSpan, CFR

Thickness	4" & 6" thick panels, 0.028 inch/24 gauge
Metal surface texture	Stucco Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Profile	2" standing seam w/ Mesa profile
Panel width (approx.)	42", standing seam 42" o.c.
Side joints	Overlapping type

2.7. Interior Face Sheet: MetlSpan, CFR

Thickness	0.028 inch/24 gauge
Metal surface texture	Stucco Embossed,
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Profile	Mesa
Panel width (approx.)	42”
Side joints	Overlapping type

2.8 METAL ROOF PANEL ACCESSORIES

2.8.1 Metal Roof Panel Accessories, General: Provide complete metal roof panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, snow guards, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap tapes, closure strips, and caps for a complete installation. Fabricate and install accessories in accordance with SMACNA Manual.

2.8.2 Formed Flashing and Trim: Match material, thickness, and color of metal roof panel face sheets.

2.8.3 Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on Drawings:

- Base trim.
- Coping.
- Panel installation perimeter.
- Opening perimeters.

2.8.4 Sealants: One or Two component polyurethane sealant compounds shall be as recommended by the metal roofing manufacturer for use in the project location. The locations and types of sealant joints shall be indicated on the shop drawings.

2.8.5 Panel Clips: Concealed stainless steel clip configured specifically for metal roof panel profile, engaging face and liner panel edge without compressing panel insulation.

2.8.6 Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal roof panels.

2.9 DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. The marking shall consist of the Contractor's name, project address, Owner's name, and Architect/Engineer's job number. Materials shall not be

shipped until the shop drawings and samples have been reviewed, and the notarized certificates have been furnished. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

3.0 EXECUTION

3.1 EXAMINATION

3.2. GENERAL

The installer shall be approved by the manufacturer of the roof panel. Installation shall be performed by experienced personnel. Materials shall be erected with all horizontal lines level and all vertical lines plumb. All exposed surfaces shall be free of blemishes, tool marks or imperfections. Panels damaged or with noticeable color or texture variations shall be rejected, removed from the site and replaced with new panels at no additional cost to the Owner. Trim shall conform to the details shown on the Drawings. Where panel thicknesses vary from those shown on the Drawings, the Contractor shall be responsible for re-detailing for review all trim, fascia and eave blocking, steel detailing and other items affected by the variation in panel thickness.

3.3. HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored on pallets, off-the-ground and, if exposed to the weather, covered with a waterproof material. Surfaces of panels shall be protected from damage and stain.

3.4. SCHEDULING AND COORDINATION

Scheduling and coordination of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.5. ACCEPTANCE OF OTHER WORK

Before beginning the installation of roofing units, the Contractor shall inspect other installed work which may affect the installation of the roofing system. The Contractor shall inform the Owner's Representative of any conditions which would prevent the proper installation of the roofing system. Beginning the installation of roofing units shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of the roofing system.

3.6. ELECTROLYTIC PROTECTION

Electrolytic protection as recommended by the roofing manufacturer shall be provided between dissimilar metals in contact, and between metals in contact with concrete, masonry, mortar, wood, or other material which could produce galvanic action. Protective material shall not be visible in the completed installation.

3.7. ERECTION

3.7.1. Roofing systems shall be field assembled and attached to the structure in accordance with the reviewed shop drawings and manufacturer's printed erection procedures.

3.7.2. Fasteners shall be evenly spaced on uniformly straight horizontal lines, and shall be sized and located to provide the wind load resistance specified herein.

3.7.3. End and side laps shall be those recommended by the roofing system manufacturer and shown on the shop drawings.

3.7.4. Flashing, trim and accessories shall be installed in a neat workmanlike manner and securely fastened in place in accordance with the reviewed shop drawings.

3.7.5. Caulking shall be carefully placed and any spillage immediately removed. At completion, the roofing shall be weather-tight throughout.

3.8. CLEANING AND PROTECTION

Cleaning and protection of installed roofing shall be the responsibility of the Contractor until the project has been accepted by the Owner. The Contractor is cautioned that minor soil or water on panel surfaces, if left in place, may cause permanent discoloration which will be cause for rejection. Panels shall be protected from damage by other trades during construction. Damaged or discolored installed roofing shall be removed and replaced with new roofing by the Contractor at no additional cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**INSULATED CORE METAL WALL PANEL**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1503**	REV. **0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 074213.19

INSULATED CORE METAL WALL PANEL

1.0 GENERAL

1.1 SECTION INCLUDES

The work under this section includes all materials, labor, equipment and services for foamed-insulation-core vertical metal wall panel assembly manufactured metal siding in accordance with the Drawings, Construction Specifications, and Scope of Work Documents.

1.2 PUBLICATIONS REFERENCED HEREIN

- AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtainwalls and Sloped Glazing Systems.
- AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
- AAMA 621 - Voluntary Specification for High Performance Organic coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
- AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- ASTM A653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ASTM A755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- ASTM C920 - Specification for Elastomeric Joint Sealants.
- ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
- ASTM E72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
- ASTM E84 - Test Methods for Surface Burning Characteristics of Building Materials.
- ASTM E119 - Test Methods for Fire Tests of Building Construction and Materials.
- ASTM E283 - Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen.
- ASTM E330 - Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

- ASTM E331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- ANSI/FMG 4880 Standard for Evaluating Insulated Wall & Roof/Ceiling Assemblies.
- UL 263 - Fire Tests of Building Construction and Materials.
- UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.3 PERFORMANCE REQUIREMENTS

1.3.1. General: Provide metal wall panel system meeting performance requirements as determined by application of specified tests by a qualified testing agency on manufacturer's standard assemblies.

1.3.2. Air Infiltration: Maximum 0.014 cfm/sq. ft. (0.007 L/s per sq. m) per ASTM E1680 at a static-air-pressure difference of 12 lbf/sq. ft. (575 Pa).

1.3.3. Water Penetration, Static Pressure: No uncontrolled water penetration per ASTM E1646 at a minimum static differential pressure of 20 lbf/sq. ft. (958 Pa).

1.3.4. Structural Performance: Provide metal wall panel assemblies capable of withstanding the effects of indicated loads and stresses within limits and under conditions indicated, per ASTM E72:

- Wind loads: Basic Wind Speed = 120 mph (nominal design 3-second gust wind speed at 33 ft above ground for Exposure C category, ASCE 7-10, Chapter 26-30, Risk Category III
- Deflection Limits: Withstand test pressures of 150 percent of inward and outward wind-load design pressures with maximum deflection of L/180 of the span with no evidence of failure.

1.3.5. Factor of Safety: Allowable working capacity shall have a minimum factor of safety of 2.5 for live loads and 1.9 for wind loads, measured against the ultimate panel strength.

1.3.6. Seismic Performance: Provide metal wall panel assemblies capable of withstanding the effects of earthquake motions in accordance with the seismic design criteria as outlined in the 2018 Kentucky Building Code for the area in which the building is located.

1.3.7 Thermal Movements: Allow for thermal movements from variations in both ambient and internal temperatures. Accommodate movement of support structure caused by thermal expansion and contraction. Allow for deflection and design for thermal stresses caused by temperature differences from one side of the panel to the other.

1.3.8 Thermal Performance: Thermal-resistance (R) value of R26, per ASTM C518 at 75 degree mean temperature, corrected to 15 mph wind outside and still air inside.

1.3.9 Fire Performance Characteristics: Provide metal wall systems with the following fire-test characteristics determined by indicated test standard as applied by UL or other testing and inspection agency acceptable to authorities having jurisdiction.

1.3.10 Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

- The finished panel in a four (4) inch thickness shall meet the requirements of a one (1) hour fire resistant rating for non-bearing wall, listed by UL per design number U050.
- The finished panel in a seven (7) inch thickness shall meet the requirements of a two (2) hour fire resistant rating for non-bearing wall, listed by UL per design number U050.
- The one (1) and two (2) hour fire rated wall panel shall meet the requirements of penetration fire stop conditions listed by UL in accordance with ASTM E814 per UL Designs W-N-1001 thru W-N-7001.

1.3.11 Surface-Burning Characteristics (Polyurethane Insulated Core): Provide metal wall system panels with the following characteristics when tested per ASTM E84.

- Flame spread index: 25 or less.
- Smoke developed index: 450 or less.
- Fire Performance of Insulated Wall: Class 1 wall panel per ANSI/FM 4880.

1.3.12 Insulating Core: Polyurethane with zero ozone depletion potential blowing agent.

- Closed Cell Content: 90% or more as determined by ASTM D6226
- Compressive Strength: As required to meet structural performance requirements and with a minimum of 15 psi as determined by ASTM D1621
- Minimum Density: 2.0 pcf (32 kg/m3) as determined by ASTM D1622

1.3.13 Surface-Burning Characteristics (Mineral Wool Core): Provide metal wall system panels with the following characteristics when tested per ASTM E84.

- Flame spread index: 0
- Smoke developed index: 0
- Fire Performance of Insulated Wall: Class 1 wall panel per ANSI/FM 4880.
- Combustibility of Core Material: Non-combustible when tested in accordance with ASTM E136.

1.3.14 Insulating Core: Mineral wool, ASTM C612, Type IV B, Category 2, non-combustible, with oriented strand fibers aligned perpendicular to metal facing panels.

- Nominal Density of 8.5 lb/cu. ft.
- Thermal resistivity of 3.61 deg F x h x sq. ft./Btu x in. at 75 deg F.

1.4 SUBMITTALS

1.4.1. Product Data: Manufacturer’s data sheets for specified products.

1.4.2. Shop Drawings: Provide shop drawings prepared by manufacturer or manufacturer's authorized dealer. Include full elevations showing openings and penetrations. Include details of each condition of installation and attachment. Provide details, at a minimum scale 1-1/2 inch per foot, of all required trim and extrusions needed for a complete installation

1.4.3. Samples for Initial Selection: For each product specified including sealants and gaskets. Provide two color samples to Architect for review and approval prior to fabrication.

1.4.4. Samples for Verification: Provide 12-inch- (305 mm-) long section of metal wall panel showing finishes, vertical joint return, injected core material, and anchoring details. Provide 12-inch- (305 mm-) long pieces of each extruded aluminum trim and gaskets.

1.4.5. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

1.4.6. Coordination Drawings: Layout drawings and detail drawings coordinating the installation of wall and roof panels with purlins, and other secondary framing. Coordinate penetrations, openings, and mechanical attachments.

1.4.7. Qualification Information: For Installer firm and Installer's field supervisor.

1.4.8. Manufacturer's warranty: Submit sample warranty.

1.4.9. Maintenance data.

1.5 WARRANTY

1.5.1 Special Manufacturer's Warranty: Submit Manufacturer's two (2) year limited warranty providing panels to be free from defects in materials and workmanship, beginning from the date of substantial completion excluding coil coatings (paint finishes) that are covered under a separate warranty.

1.5.2 The installation contractor shall issue a separate warranty against defects in installed materials and workmanship, beginning from the date of substantial completion of the installation.

1.5.3 Special Panel Finish Warranty: Submit Manufacturer's limited warranty on the exterior paint finish for adhesion to the metal substrate and limited warranty on the exterior paint finish for chalk and fade.

2.0 PRODUCTS

2.1 MANUFACTURER

MetlSpan is named for the purpose of establishing acceptable standards of form and quality. Equivalent reviewed products of other manufacturers, meeting the requirements of this Specification, may be used for the project.

2.2 GENERAL

All materials used shall be subject to review. Siding shall be field assembled. Exterior siding panels shall be furnished in lengths to provide the minimum number of horizontal joints. Over-all length of siding assembly shall be as indicated on the Drawings.

2.3 WIND LOADING

The installed system shall comply with the requirements 2018 Kentucky Building Code for wind loads at the specific installed heights of the siding above ground level without deflecting more than L/120 of the girt span shown on the Drawings.

2.4 METAL SHEETS

Metal sheets for material hereinafter specified shall consist of Aluminum-Zinc Alloy-Coated Steel Sheets, ASTM A792/A 792M, structural quality, Grade 50, Coating Class AZ50 pre-painted by the coil-coating process per ASTM A755/A 755M, finish as specified.

2.5 INSULATED METAL WALL PANELS

2.5.1 Non fire-resistance-rated wall panel siding shall consists of MetlSpan's LS-36: Lap Seam, Exposed Fastener, Foamed-Insulation-Core Metal Wall Panels: Structural metal panels consisting of exterior metal sheet with ribs and minor rib imprinting in the vertical direction, and interior metal sheet, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using exposed fasteners.

- Panel thickness shall be 4", with R-30 thermal resistance.
- Panel thickness shall be 6", with R-44 thermal resistance.
- Color on all exposed surfaces shall be as selected by the Owner.

2.5.2 Fire-resistance-rated wall panel siding shall consist of MetlSpan's ThermalSafe Fire-Resistant-Thermal-Insulation-Core Metal Wall Panels: Structural metal panels consisting of exterior metal sheet with ultra-light Mesa wave pattern 1/32-inch and interior metal sheet with ultra-light Mesa wave pattern 1/32-inch deep, with structural mineral wool core factory-bonded during fabrication in thermally-separated profile, with tongue-and-groove panel edges designed to form weathertight seals, attached to supports using exposed fasteners.

- Color on all exposed surfaces shall be as selected by the Owner.

2.6. Exterior Face Sheet: MetlSpan LS-36

Thickness	4" & 6" thick panels, 0.028 inch/24 gauge
Metal surface texture	Ribbed and embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Panel width (approx.)	36", major rib spacing, 12" o.c.
Side joints	Overlapping type

2.7. Interior Face Sheet: MetlSpan LS-36

Thickness	0.028 inch/24 gauge
Metal surface texture	Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner

Panel width (approx.)	36”, embossed rib spacing, 4” o.c.
Side joints	Overlapping type

2.8. Exterior Face Sheet: MetlSpan, ThermalSafe

Thickness	4” thick (1-hour) panel, 7” thick (2-hour) 0.028 inch/24 gauge
Metal surface texture	Mesa Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by Owner
Profile	1/32” deep wave pattern (Mesa) w/ exposed fasteners
Panel width (approx.)	36”
Side joints	Flush double tongue and groove

2.9. Interior Face Sheet: MetlSpan, ThermalSafe

Thickness	0.028 inch/24 gauge
Metal surface texture	Mesa Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by Owner
Profile	1/32” deep wave pattern (Mesa) w/ exposed fasteners
Panel width (approx.)	36”
Side joints	Flush double tongue and groove

2.10 METAL WALL PANEL ACCESSORIES

Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap tapes, closure strips, and caps for a complete installation. Fabricate and install accessories in accordance with manufacturer’s written instructions.

Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.

Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on the Drawings:

- Base trim
- Coping
- Panel installation perimeter
- Opening perimeters

Sealants: One or Two component polyurethane sealant compounds shall be as recommended by the metal panel system manufacturer for use in the project location. The locations and types of sealant joints shall be indicated on the shop drawings.

Panel Clips: Concealed stainless steel clip configured specifically for metal wall panel profile, engaging face and liner panel edge without compressing panel insulation.

Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels.

2.11 DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. The marking shall consist of the Contractor's name, project address, Owner's name, and Architect/Engineer's job number. Materials shall not be shipped until the shop drawings and samples have been reviewed, and the notarized certificates have been furnished. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

3.0 EXECUTION

3.1 GENERAL

The installer shall be approved by the manufacturer of the siding. Installation shall be performed by experienced personnel. Materials shall be erected with all horizontal lines level and all vertical lines plumb. All exposed surfaces shall be free of blemishes, tool marks or imperfections. Panels damaged or with noticeable color or texture variations shall be rejected, removed from the site and replaced with new panels at no additional cost to the Owner. Trim shall conform to the details shown on the Drawings. Where siding thicknesses vary from those shown on the Drawings, the Contractor shall be responsible for re-detailing for review all trim, fascia and eave blocking, steel detailing and other items affected by the variation in siding thickness.

3.2 HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored on pallets, off-the-ground and, if exposed to the weather, covered with a waterproof material. Surfaces of panels shall be protected from damage and stain.

3.3 SCHEDULING AND COORDINATION

Scheduling and coordination of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.4 ACCEPTANCE OF OTHER WORK

Before beginning the installation of siding units, the Contractor shall inspect other installed work which may affect the installation of the siding system. The Contractor shall inform the Owner's Representative of any conditions which would prevent the proper installation of the siding system. Beginning the installation of siding units shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of the siding system.

3.5 ELECTROLYTIC PROTECTION

Electrolytic protection as recommended by the siding manufacturer shall be provided between dissimilar metals in contact, and between metals in contact with concrete, masonry, mortar, wood, or other material which could produce galvanic action. Protective material shall not be visible in the completed installation.

3.6 ERECTION

3.6.1 Siding systems shall be field assembled and attached to the structure in accordance with the reviewed shop drawings and manufacturer's printed erection procedures.

3.6.2 Fasteners shall be evenly spaced on uniformly straight horizontal lines, and shall be sized and located to provide the wind load resistance specified herein.

3.6.3 End and side laps shall be those recommended by the siding system manufacturer and shown on the shop drawings.

3.6.4 Flashing, trim and accessories shall be installed in a neat workmanlike manner and securely fastened in place in accordance with the reviewed shop drawings.

3.6.5 Caulking shall be carefully placed and any spillage immediately removed. At completion, the wall shall be weather-tight throughout.

3.7 CLEANING AND PROTECTION

Cleaning and protection of installed siding shall be the responsibility of the Contractor until the project has been accepted by the Owner. The Contractor is cautioned that minor soil or water on panel surfaces, if left in place, may cause permanent discoloration which will be cause for rejection. Panels shall be protected from damage by other trades during construction. Damaged or discolored installed siding shall be removed and replaced with new siding by the Contractor at no additional cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**SHEET METAL FLASHING AND TRIM**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1504**	REV. **0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 076200

SHEET METAL FLASHING AND TRIM

1. **GENERAL**

1.1. SCOPE

Work under this section includes all materials, labor, equipment and services for sheet metal work in accordance with the Drawings, Specifications, and Scope of Work Document.

1.2. PUBLICATIONS REFERENCED HEREIN

- American Society for Testing and Materials (ASTM) latest edition of the standard referenced, unless a specific edition is named
- Architectural Sheet Metal Manual of the Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA Manual)
- Federal Specifications, sections referenced

1.3. DEFINITIONS

Gauges. Thicknesses of metal sheet are expressed in decimal fractions of one inch except that thicknesses of copper and lead sheets are established by defining the weight of one square foot of the material.

1.4. SUBMITTALS

1.4.1. Shop Drawings shall show plans, elevations, sections, profiles, materials, gauges, methods of fastening, locations and other data necessary to show compliance with the contract documents.

1.4.2. *Samples.* Provide three 6 inches by 6 inches samples of each type of sheet metal required.

1.5. GENERAL REQUIREMENTS

The materials for and installation of all sheet metal work shall conform to this Specification, the recommendations of the materials manufacturers and the recommendations of the SMACNA Manual.

2. **PRODUCTS**

2.1. GENERAL

All materials used shall be subject to review.

2.2. METAL SHEET

2.2.1. Aluminum sheet shall conform to ASTM Designation B209, Alloy 3004-H14 Alclad, and shall be 0.032 inch thick except where otherwise indicated on the Drawings or specified.

2.2.2. Galvanized steel sheet shall conform to ASTM Designation A526, commercial quality, coating designation G90, phosphatized, and shall be 0.0239 inch thick unless otherwise indicated on the Drawings or specified.

2.2.3. Aluminum brackets and other items fabricated from aluminum bar or plate shall conform to ASTM B209, Alloy 3004, H14, Alclad, and shall be sized as indicated on the Drawings or as specified.

2.2.4. Galvanized Steel Brackets and other items fabricated from galvanized steel bar or plate shall conform to ASTM Designation A123, and shall be sized as indicated on the Drawings or as specified.

2.2.5. Lead Flashings shall be fabricated from 6 pound lead conforming to Federal Specification QQ-L-201F(2).

2.2.6. Fasteners shall be stainless steel. Fasteners shall be of the types and sizes indicated on the Drawings or specified. Where not otherwise indicated fasteners shall be of the type and size best suited for the intended use.

2.2.7. Solder, welding wire or rods, etching, and flux materials shall be the types recommended by the manufacturer of the sheet metal on which the materials are used.

2.2.8. Pre-fabricated Expansion Joint Covers shall be stainless steel and neoprene insulated type "EXPAND-O-FLASH" manufactured by Manville Products Corporation, or reviewed equivalent. Unless shown otherwise on the Drawings, metal flanges shall be stainless steel.

2.2.9. Caulking shall be as specified in the 143993-ASA-DD3-SPC-1508 – JOINTS AND SEALANTS Specification.

2.2.10. Insulation for protecting sheet metal work from electrolytic action shall be that recommended by the sheet metal manufacturer as appropriate for each application condition.

2.3. SHOP FABRICATION

Sheet metal work shall be shop fabricated and shall comply with the requirements of the Sheet Metal and Air Conditioning Contractors National Association, Inc.'s *Architectural Sheet Metal Manual* (SMACNA Manual) and the contract Drawings. Materials shall be fabricated as shown on the reviewed shop drawings. Lines, arises, and angles shall be sharp and true; surfaces shall be free from buckles, warps, and waves. Exposed edges shall be folded to form a ½ inch wide hem on the side which will be concealed from view. Joints shall be formed to exclude, or readily drain, water. Fabricated material shall be free from burrs, slivers, sharp edges, and cuts.

2.4. DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Shipping and marking shall be accomplished in a manner which will prevent damage and clearly identify the material. Materials shall not be shipped until the shop drawings and samples have been reviewed. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

3. EXECUTION

3.1. HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored on pallets, off the ground, and protected in a manner which will prevent staining or discoloration.

3.2. SCHEDULING AND COORDINATING

Scheduling and coordination of work specified in this Section with that specified in other sections shall be the responsibility of the Contractor.

3.3. ACCEPTANCE OF OTHER WORK

Before beginning the installation of materials, the Contractor shall inspect other installed work which may affect the installation of the sheet metal. Abutting or connecting work and work to be concealed by sheet metal shall be complete and in proper condition to receive sheet metal work before sheet metal materials are installed. The Contractor shall inform the Owner's Representative of any conditions which would prevent the proper installation of the sheet metal so that these items may be corrected. Beginning the installation of sheet metal materials shall indicate the Contractor's acceptance of other installed work as being complete and acceptable for the proper installation of the sheet metal work. Treated wood blocking and nailers to which sheet metal items are to be attached shall be dry prior to attaching sheet metal items in place.

3.4. GENERAL

Materials furnished under this section which are to be built in by others shall be delivered to the site in time to avoid delays to construction progress. All cutting, fitting, drilling and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. All accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or specified, shall also be provided under this section. Lines, arises, and angles shall be sharp and true, and horizontal lines shall be level, sloped lines shall be straight and vertical lines shall be plumb. Installed sheet metal work shall be free from leakage and asphalt or flashing cement spills.

3.5. ELECTROLYTIC PROTECTION

Sheet metal which will be in contact with concrete, masonry, mortar, wood, dissimilar metal, and other materials which could cause electrolytic action shall be insulated against such action prior to installation. Insulation shall not be visible after sheet metal has been installed.

3.6. INSTALLATION

Installation shall be accomplished in accordance with the applicable requirements of the SMACNA Manual, as specified, and as indicated on the Drawings. Unless otherwise indicated, horizontal surfaces of flashings shall be anchored with screws or nails and vertical surfaces of flashing shall be anchored with cleats.

3.6.1. Expansion and contraction joints shall be provided at intervals recommended by the sheet metal manufacturer, but intervals shall not exceed 20 feet. Joints shall be evenly spaced.

3.6.2. Unless otherwise shown or specified, fastenings shall be concealed. Nails or screws shall be spaced on 6 inch centers unless otherwise shown, specified, or approved.

3.6.3. Individual and continuous cleats: Sections of continuous cleats shall not exceed 10 feet in length, with a ¼ inch space between sections. Continuous cleats shall be secured to wood blocking or nailers at 6 inches on centers. Individual cleats shall be 2 inches wide by the required length and formed of sheet metal one gauge heavier than the member being fastened. Secure individual cleats to wood nailers or blocking with two nails spaced ¾ inch from the end; turn end of cleat back to cover nail heads. Lock other end of cleat into seam or the folded edge of member being fastened. Use cleats for securing hemmed exposed edges of sheet metal members over 5 inches wide and at other locations shown or specified. Space individual cleats not more than 12 inches apart unless otherwise shown.

3.7. CAP AND COUNTER FLASHINGS

Cap and counter flashings shall be formed in 8 to 10 feet lengths. Joints shall be lapped at least 3 inches; do not solder or weld joints. Stagger joints in relation to joints in lapping members. Make flashing continuous at angles. Cap and counter flashing shall overlap base flashing at least 4 inches. Bottom edge of flashing shall be folded back 2 inch on underside to provide a reinforced edge. Where roof flashing terminates, provide roof membrane manufacturer's standard termination bar. The termination bar installation, fastener spacing, etc. shall comply with manufacturers recommendations.

3.8. GRAVEL STOPS AND FASCIA

Gravel stops and fascias shall be formed in 8 to 10 feet lengths, and be installed with ¼ inch expansion spaces between ends of each length of gravel stop and fascia. The gravel stops and fascia expansion spaces shall be sealed with minimum 6¼ inch wide cover plates and concealed splice plates to match the profile of the member flashed. The bottom edge of splice plates and cover plates shall be bent to lock into the bottom hemmed drip edges of the gravel stops and fascias, and splice plates and cover plates shall overlap gravel stops and fascias 3 inches minimum. Set each edge of cover and splice plates into a 1 inch wide minimum strip of roofing cement applied to the cover and splice plate. Nail horizontal surfaces of splice plates and cover plates to wood blocking and nailers, sinking nails for the cover plate in the ¼ inch expansion space between the ends of the gravel stops and fascias. Extend flanges of fascia and gravel stops out on top of built up roofing felts not less than 4 inches; unless otherwise indicated secure flange to wood nailers with flat head, annular ring, stainless steel nails, 3/4 inches (minimum) long; space nails 6 inches on center, staggered 2 inches. Clip lower hemmed edge of fascias and gravel stops to cleats as detailed and specified. Gravel stops and fascias with vertical face dimensions less than 5 inches high may be overlapped a minimum of 4 inches. Do not fasten overlap width to overlapped member. Seal overlap with mastic.

3.9. GUTTERS, CONDUCTOR HEADS, AND SCUPPERS

Gutters, conductor heads, and scuppers shall be of the sizes and shapes shown on the Drawings and shall be located where indicated. All joints shall be lapped, riveted, and soldered. Expansion joints in gutters shall be provided midway between downspouts. Outlets shall be provided with tubes soldered to gutter and extending 3 inches minimum into downspouts with slip joints. All gutter outlets shall be fitted with stainless steel basket type strainers, set in loosely. All gutters, conductor heads, and scuppers (full length of gutter installation) shall be provided with heat trace cabling for ice and snow melt applications. Provide complete system meeting requirements of Section 143993-ASA-DD3-SPC-1511 ELECTRIC HEAT TRACING SYSTEM FOR GUTTERS.

3.10. DOWNSPOUTS

Downspouts, unless otherwise indicated, shall be rectangular conductors sized and located as indicated on the Drawings, and shall be securely held in position, clear of the wall by anchors of the design indicated on the Drawings spaced not more than 12 feet apart with a minimum of three (3) anchors for each downspout. All downspouts (full height down to 12 inches below grade), shall be provided with heat trace cabling for ice and snow melt applications. Provide complete system meeting requirements of Section 143993-ASA-DD3-SPC-1511 ELECTRIC HEAT TRACING SYSTEM FOR GUTTERS.

3.11. MISCELLANEOUS FLASHINGS

Miscellaneous flashings shall be provided where indicated or required by the work. The forming and installation of flashings shall be as indicated and required by applicable sections of the SMACNA Manual.

3.12. CLEANING AND PROTECTION

Cleaning and protection of installed sheet metal shall be the responsibility of the Contractor until the project has been accepted by the Owner. Cleaning materials shall be those recommended by the sheet metal manufacturer. Other materials shall be protected from damage by the cleaning processes and materials. Sheet metal shall be protected from damage by other trades during construction. Damaged or discolored installed sheet metal shall be removed and replaced with new sheet metal by the Contractor at no additional cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**FIRESTOPPING**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1505**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

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SECTION 07840

FIRESTOPPING

1.0 GENERAL

1.1 SECTION REQUIREMENTS

A. Submittals: Product Data and product certificates signed by manufacturer certifying that products furnished comply with requirements. Systems which have an equivalent F-rating, but different UL Design Numbers due to use of an equivalent alternative manufacturer, may be used. Ensure clarity for each submitted system, as to which specific condition (location) it applies and in lieu of which Design Number from the Drawings, it is being submitted.

B. Provide firestopping systems with fire-resistance ratings indicated by reference to UL designations as listed in its "Fire Resistance Directory," or to designations of another testing agency acceptable to authorities having jurisdiction.

C. Provide through-penetration firestopping systems with F-ratings indicated, as determined according to ASTM E814, but not less than fire-resistance rating of Construction penetrated.

D. For exposed firestopping, provide products with flame-spread indexes of less than 25 and smoke-developed indexes of less than 450, as determined according to ASTM E84.

E. Provide spray-applied fire-resistive materials to cover exposed supporting members for fire-rated metal wall panel systems, whether or not called out on the Drawings at each member location, compliant with the requirements of ASTM E736. Where spray-applied fire-resistive materials are required, provide thickness as required by selected manufacturer's product-specific UL Design Number. Refer to the Drawings for fire rated wall locations.

2.0 PRODUCTS

2.1 FIRESTOP SYSTEMS

A. Cut sheets containing full description of requirements for all mentioned wall assemblies and penetration firestopping systems are available online at http://productspec.ul.com/index.php :

B. Any through-penetration firestop system that is classified by UL for the application and with F-rating indicated, may be used. Any selected system shall be confirmed compatible with the UL Design Numbers for fire-rated partition and wall assemblies utilized in this Project, including:

- Insulated Metal Wall Panels, 1 and 2 hours: **UL Design Number U050**
- Masonry Construction, 2 hours: **UL Design Number U905**
- Gypsum Board Construction, 1 hour: **UL Design Number U419**

C. UL-classified wall system designations required are indicated on the Wall Type Legend in the Drawings. For penetration typical protection requirements for the systems listed below, refer to Underwriters Laboratories System Designs.

- Head of Wall CMU to Decking/Slab: **UL Design Number HW-D-0294**

- Horizontal Gypsum Barrier, 1 and 2 hours: **UL Design Number I501**
- Control Joint System in Masonry Fire-Rated Construction: **UL Design Number WW-D-0001**
- Floor Slab on Metal Deck, over Rated Room: **UL Design Number P-902.**
- Firestop Systems for Metallic Pipes, Tubing, or Conduit through U050: **UL Design Number W-N-1001,**
- Firestop Systems Ducts through U050: **UL Design Number W-N-7001**
- Firestop Systems Ducts through Concrete: **UL Design Number C-AJ-7012**
- Firestop Sealant in Annular Space around Steel Penetrations: **UL Design Number W-N-5003**

3.0 EXECUTION

A. Install firestopping systems to comply with requirements listed in testing agency's directory for indicated fire-resistance rating.

B. Prior to application of spray-on fire resistive materials, ensure proper preparation of substrate in compliance with ASTM E736 *Standard Test Method for Cohesion / Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members*.

C. Identification: Identify through-penetration firestop systems with permanent labels attached to surfaces adjacent to firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb."
2. Classification/listing designation of applicable testing and inspecting agency.
3. Through-penetration firestop system manufacturer's name and product name.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE: **OVERHEAD COILING DOORS**	PROJECT DOC. NO.: **143993-ASA-DD3-SPC-1506**	REV. **0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

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PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
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SECTION 083323

OVERHEAD COILING DOORS

1. GENERAL

1.1. SCOPE

Work under this section includes all materials, labor, equipment and services for overhead coiling doors in accordance with the Drawings, Specifications, and Scope of Work Document.

1.2. PUBLICATIONS REFERENCED HEREIN

- Underwriters' Laboratories, Inc. (U.L.)
- National Electrical Manufacturers' Association (NEMA) Standards

1.3. DEFINITIONS

Gauges. Thicknesses of metal sheet are expressed in decimal fractions of one inch.

1.4. SUBMITTALS

Shop Drawings shall show elevations; construction of all items; hardware; wiring diagrams for electric operation (where required); thickness of metal; head, jamb, sill conditions; anchor requirements with actual materials used; and job site locations (opening designation) of each door.

1.5. GENERAL REQUIREMENTS

The materials for and installation of all overhead coiling doors shall conform to this specification, and the recommendations of the overhead coiling door manufacturer.

2. PRODUCTS

2.1. GENERAL

All materials used shall be subject to review. All overhead coiling doors shall be the products of one manufacturer. Products specifically named are specified to establish standards of quality. Equivalent products of other manufacturers which conform to the requirements of this specification may be submitted for review. Complete data shall be included in the submission.

2.2. REFERENCED MANUFACTURER

Basis of Design is Wayne Dalton . Reviewed equivalent doors manufactured by the Alpine Overhead doors, Cornell Cookson Company or The Overhead Door Company may be furnished for the project.

2.3. OVERHEAD COILING DOOR TYPES

- Exterior, sound resistant overhead rolling doors shall be Alpine Model Insul-Sound, Sound Retardant Rolling Service Door
- Interior, non-fire-rated overhead coiling doors shall be Wayne-Dalton, Model No. 800
- Exterior non-fire-rated overhead coiling doors shall be Wayne-Dalton Model No. 800C (insulated) Service Door
- Interior, fire-rated coiling doors shall be Wayne-Dalton Model FireStar 700
- Exterior, fire-rated coiling doors shall be Wayne-Dalton Model Firestar 700C (insulated) Rolling Steel Fire Door

- All overhead coiling doors provided shall be electrically operated as indicated on the Drawings, with manual bypass operation by means of a chain hoist. Doors shall be surface mounted with guides and head set back a sufficient distance from the frame to provide the clear opening size indicated in the Door Schedule when door is in the open position. The door type, location, and operating method of each door are shown on the Drawings.

2.3.1. Model Insul-Sound Door curtains will be composed of interlocking, rolled formed 2 ¾" IPB-S interlocked slats, 18 gauge galvanized steel stats with 22 gauge back slats. Back slats shall be Galvanized steel, G90 coating exterior (G60 interior), Structural Quality Grade C, as per ASTM A 653/ A 653 M.

- Insulation within the slats shall be sound and thermal barrier hard weather resistant plastic with filled-in core. R-Value: 7.20
- End locks for slats shall be the manufacturer's standard design.
- Bottom Bar for Sound Resistant Shutters, Rolling Shutters, Insulated Sound Doors shall consist of two roll formed steel angles which extend into guides, designed to reinforce curtain bottom
- Curtain shall be equipped with a noise reduction sound barrier snap on PVC and insulated core backing. STC Rating shall be no less than 30.

2.3.2. Model 800 Service Door curtains will be composed of interlocking #4 profile 22 gauge steel slats, to resist a minimum wind pressure of 20 pounds per square foot with a maximum deflection of 0.33 inch per linear foot of opening width. Curtain shall roll up on a drum supported on brackets and shall be balanced by helical springs.

- This style shall be provided at unrated, interior locations except where noted otherwise.
- End locks for slats shall be the manufacturer's standard design.
- Bottom rail of the curtain shall consist of two steel angles of equal weight, one on each side, fastened to the bottom of the curtain. Provide a rubber or vinyl weather seal at the door bottom. This seal shall be equipped with a safety contact device on electric operated doors.

2.3.3. Model 800C Service Door curtains will be composed of interlocking #14 flat, 18 gauge galvanized steel slats with 22 gauge back slats, to resist a minimum wind pressure of 20 pounds per square foot with a maximum deflection of 1/120th of the opening width. The area between the #14 exterior slat and the back slat will be filled with polyurethane insulation, R-Value of 6.7. Curtain shall roll up on a drum supported on brackets and shall be balanced by helical springs.

- This style shall be provided at unrated, exterior locations except where noted otherwise.
- End locks for slats shall be the manufacturer's standard design.
- Bottom rail of the curtain shall consist of two steel angles of equal weight, one on each side, fastened to the bottom of the curtain. Provide a rubber or vinyl weather seal at the door bottom. This seal shall be equipped with a safety contact device on electric operated doors.

2.3.4. Firestar 700 Rolling Steel Fire Door curtains will be composed of interlocking curved slats, 18 gauge minimum galvanized steel slats, roll-formed per ASTM standards. Ends of alternate slats will be fitted with metal end locks.

- This style shall be provided at fire-rated, interior locations except where noted otherwise.
- Shall provide UL approved release mechanism.
- Door will be operated by means of motor operation. Sensing edge to be attached to bottom bar to stop and reverse the door when it contacts an object during the closing cycle.
- Rolling fire door will bear hour label as indicated on the door schedule. Rolling fire doors will be manufactured in strict accordance with the requirements of Underwriters Laboratories-listed procedure or Factory Mutual-approved procedures, and will bear the UL or FM label (tag).
- Door system shall comply with NPFA 80.

2.3.5. Firestar 700C Rolling Steel Fire Door curtains will be composed of interlocking #34 flat profile, 22 gauge galvanized steel slats with 24 gauge back slats, to resist a minimum wind pressure of 20 pounds per square foot with a maximum deflection of 1/120th of the opening width. The area between exterior slat and the back slat will be filled with mineral wool insulation, R-Value of 5.0. Curtain shall roll up on a drum supported on brackets and shall be balanced by helical springs

- This style shall be provided at fire-rated, exterior locations except where noted otherwise.
- Shall provide UL approved release mechanism.
- Door will be operated by means of motor operation. Sensing edge to be attached to bottom bar to stop and reverse the door when it contacts an object during the closing cycle.
- Rolling fire door will bear hour label as indicated on the door schedule. Rolling fire doors will be manufactured in strict accordance with the requirements of Underwriters Laboratories-listed procedure or Factory Mutual-approved procedures, and will bear the UL or FM label (tag) for up to four-hour fire resistance rating.
- Door system shall comply with NFPA 80.

2.3.6. Guides shall be standard rolled steel angles not less than 3/16 inches thick, and shall form a channel pocket of sufficient depth to retain the curtain in place under the wind pressure specified. Guides shall be securely attached to adjacent construction as indicated on the reviewed Shop Drawings.

2.3.7. Hoods shall be constructed of not lighter than 24 gauge steel formed to fit the contour of the end brackets and reinforced with steel rods or rolled beads at top and bottom edges.

2.3.8. *Emergency Chain Operators.* Gear reduction shall be calculated to reduce the pull required on the hand chain to not over 35 pounds. Chains shall be galvanized. The manufacturer shall provide an electric interlock.

2.3.9. *Electric Operation.* Power operated doors shall be furnished with a motor driven operator as manufactured by Lift Master (or an approved equivalent), Industrial Duty Hoist Operator sized

as required for opening and closing speed and operation as specified. This motor unit shall include a continuous-duty high-starting torque motor, a universal-mount frame design, industrial ball bearings on the output shaft, and an emergency chain hoist with an electric interlock.

2.3.9.1 The door shall operate at an average speed of not less than 1 foot per second.

2.3.9.2. The motor shall be suitable for heavy duty, severe industrial service. The motor shall be rated 480 volts, 3 phase, 60 hertz. The motor shall have industrial ball bearings on a 1" output shaft: heavy-duty oil-filled iron bearings on reduction shaft.

2.3.9.3. The coiling door shall be furnished with a full voltage, reversing type motor starter. The starter shall be a combination type with an adjustable, magnetic only type circuit breaker. The starter shall have an interrupting current rating of at least 65,000 amperes symmetrical at 480 volts. The starter shall contain a 120 volt, single phase control power transformer. This transformer shall have the ungrounded secondary lead and both primary leads fused. The other secondary lead shall be solidly grounded. The starter shall have a thermal overload device in each phase. The overload heaters shall be sized based on the motor nameplate full load current. Overload relays shall be manually resettable from starter enclosure with the door closed.

2.3.9.4. The motor shall be controlled from a pushbutton station, furnished with the unit. The pushbutton station shall include "OPEN", "CLOSED" and "STOP" momentary contact type pushbuttons. All motor controls shall be factory wired to 600 volt rated terminal blocks. The motor starters, pushbutton station, and all other control enclosures shall be rated NEMA 4X. An emergency hand chain operator which does not affect the limit switch shall be provided. An electrical safety edge extending the full width of the bottom of the door shall be provided. The safety edge shall cause the door to stop and return to the fully open position on contact with any obstruction in the path of travel.

2.3.9.5 Labeled doors shall bear the Underwriters' Laboratory label for the fire rating indicated on the Drawings.

- Labeled doors shall be equipped with a (2 link) fusible link set for 165^0F
- Labeled doors shall be wired with direct electrical connection to the building fire alarm system and shall close in the event of an alarm..

2.4. FINISH

Curtain slats, hoods, guides and rails shall be galvanized with 1.25 ounces of zinc per square foot of surface and shall be phosphate treated and Shop primed. Curtain color to be selected by Owner's Representative from the full line of available colors. All other surfaces of door parts shall be given a shop coat of rust inhibiting primer standard with the manufacturer.

All door components shall come factory-finished with manufacturer's shop-applied finish coat, over galvanizing, for each door location.

2.5. DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. Materials shall not be shipped until the manufacturer's data sheets and Shop Drawings have been reviewed. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

3. EXECUTION

3.3. HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage or deterioration.

3.4. SCHEDULING AND COORDINATING

Scheduling and coordinating of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.5. ACCEPTANCE OF OTHER WORK

Before beginning the installation of overhead coiling doors, the Contractor shall inspect other installed work which may affect the installation of these doors. The Contractor shall inform the Owner’s Representative of any conditions which would prevent proper door installation so that these items may be corrected. Beginning the installation of door materials shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of the doors.

3.6. FIELD MEASUREMENTS

The Contractor shall verify all measurements at the building site and shall be responsible for dimensions, fitting, and proper attachment of items directly connected with the door installation.

3.7. DOOR INSTALLATION

Door installation shall be by experienced personnel who have been approved by the manufacturer of the door. Installation shall be in accordance with reviewed Shop Drawings and manufacturer's directions. Anchors and inserts for guides, brackets, and other work shall be accurately located. Upon completion, doors shall be lubricated and adjusted to operate freely.

3.8. PROTECTION

Protection of the installed doors shall be the responsibility of the Contractor until the project has been accepted by the Owner. Damaged installed doors shall be removed and replaced with new doors by the Contractor at no additional expense to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE: **DOOR HARDWARE**	PROJECT DOC. NO.: **143993-ASA-DD3-SPC-1507**	REV. **0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
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SECTION 087100

DOOR HARDWARE

1.0 GENERAL

1.1 SCOPE

Work under this section includes all materials, labor, equipment and services for door hardware in accordance with the Drawings, Construction Specifications and Scope of Work Documents.

1.2 PUBLICATIONS REFERENCED HEREIN

- Underwriters' Laboratories, Inc., (U.L.), Building Materials Directory and Labeling Service
- Builders Hardware Manufacturers Association (BHMA)

1.3 SUBMITTALS

1.3.1 Hardware list shall show quantities, types, manufacturer's model numbers, functions, finishes, jobsite location (opening designation) and other data necessary to show compliance with the contract documents.

1.3.2 Manufacturer's data sheets for each type of hardware required shall be submitted with the hardware list.

1.4 MANUFACTURER COORDINATION

The Contractor shall furnish the door hardware manufacturer's templates, or samples of the actual hardware, to the manufacturer of the hollow metal doors and hollow metal frames.

1.5 DOOR HARDWARE SCHEDULE

Hardware shall be furnished for each door in accordance with this specification and the door hardware schedule on the Drawings. The Contractor shall furnish all items and components of door hardware required for a complete and operable installation. Hardware and installation thereof shall comply in all respects with the 2018 Kentucky Building Code, including all accessibility requirements.

1.6 MAINTENANCE MATERIALS

Provide extra materials that match products installed and that are packaged with protective covering for storage, and properly labeled for product identification. Coordinate with the Owner's Representative the required quantity and type of products to be provided. Actual determination to occur at a later date.

1.7 GENERAL REQUIREMENTS

The materials for and installation of all door hardware shall conform to this specification and the recommendations of the hardware manufacturers. Modifications of hardware, required because of Construction characteristics, shall provide the same operating and functioning features as scheduled hardware. Hardware for fire rated doors shall be approved by the Underwriters' Laboratories, Inc., for the fire rating required.

1.8 MAINTENANCE

Provide specialized tools and maintenance instructions for required adjustment, maintenance, and removal or replacement of door hardware.

2.0 PRODUCTS

2.1 REFERENCED MANUFACTURER

Referenced manufacturer specified or scheduled on this Specification, is named to establish standards of quality and for convenience of scheduling. Reviewed equivalent products may be provided for the project, unless indicated otherwise. Materials shall be from one source unless otherwise specified or scheduled on the Drawings.

2.2 FASTENERS

Fasteners shall be of the proper size, type and quantity for the item involved and for the surface to which it is attached. Finish shall match that of the item being fastened.

2.3 LOCKS AND LATCHSETS

- Locks and latchsets shall be heavy duty mortise type, except where otherwise specified or scheduled.
- Strikes: Provide manufacturer's standard strike for each lock bolt and/or latch bolt, with strike box and curved lip extended to protect frame. The finish of all exposed parts is to match the adjacent lock or latch set.
- Mortise Locks: Comply with BHMA A156.13 criteria, (Type B), Operational Grade 1, with stamped steel case and with steel or brass parts, Series 1000.
- Provide products from one of the following (no substitutions), subject to compliance with referenced criteria.
  - Best Access Systems; Division of the Stanley Security Solutions, Inc., Series 45H X 3H
  - DORMA Architectural Hardware; (DORMA Group) Series M9000 X LTA
  - SARGENT Manufacturing Company; (ASSA ABLOY Group), Series 8200 X LNJ
  - Schlage Commercial Lock Division; (Ingersol Rand), Series L9000 X 03B (Basis of Design)
  - Yale, 5300NL Series Grade 2 Cylindrical Lever Locks (Owner preference – include in base bid)
- Refer to the Drawings for the door hardware groups assigned at each door location; Door Vendor shall arrange an on-site meeting to review with the Owner's Representative for the lock functions as indicated on the hardware group schedule.

2.4 PANIC EXIT HARDWARE

Panic exit hardware shall be rim type, comply with BHMA A156.3 criteria, and have a US32D finish. The lockset or latchset function is scheduled on the Drawings. Trim on the side of the door opposite the push bar shall be a lever for accessibility. Where locksets are required the key shall lock and unlock the lever.

Provide products from one of the following (no substitutions), subject to compliance with referenced criteria.

- Von Duprin; (Ingersoll Rand Co.), Series 99 with 03 Lever Trim (Basis of Design)

- Precision Hardware, Inc.; Stanley Security Solutions), Series 2000 with C-Lever Trim.
- DORMA Architectural Hardware; (DORMA Group) Series 9000 with T-Lever Trim.
- SARGENT Manufacturing Company; (ASSA ABLOY Group), Series 80 with J-Lever Trim
- Yale, Series 7100F Rim (Owner preference – include in base bid)

2.5 ALARMED EXIT DEVICE

Alarmed exit device shall be fire exit type, comply with BHMA A156.3 criteria, and have a US32D finish. The function shall be exit-only in the direction of egress. Trim on the side of the door opposite the push bar shall be omitted. Upon pressing of the push bar, an alarm shall be activated. The device can be armed, disarmed, or reset via key switch. If additional cylinder is required for alarm arm/disarm/reset, provide with alarm kit. Unit shall be wired for remote power operation; provide wire harness for connection to electric power transfer hinge.

Provide products from one of the following manufacturers (no substitutions), subject to compliance with referenced criteria.

- Von Duprin; (Ingersoll Rand Co.), Model ALK-33A-EO-F (Basis of Design)
- Precision Hardware, Inc.; (Stanley Security Solutions), Series Apex 2000 with ALW Option.
- DORMA Architectural Hardware; (DORMA Group) Series 9000 with Direct-Wired Exit Alarm Option.
- SARGENT Manufacturing Company; (ASSA ABLOY Group), Series AL-80
- Yale, 600 Series Heavy Duty Trim (Owner preference – include in base bid)

2.6 LOCK CYLINDERS

Cylinders are to be tumbler type and constructed of stainless steel. The products are subject to compliance with referenced criteria. Cylinders are to be as manufactured by the lockset manufacturer. Confirm with Owner on type of Interchangeable cores.

2.7 KEYING SYSTEM

Keying system shall be a three (3) level system. Locks shall be operable with change, master, and grand-master keys. Furnish two (2) change keys for each lock, three (3) master keys for each master keyed level, and three (3) grand-master keys. Each key shall be tagged or otherwise identified, with the door designation for which it is intended.

Requirements for master and grand master keying (with existing system) shall be coordinated with the Owner's Representative.

2.8 BUTT HINGES

Hinges are to be manufactured by McKinney Products Company, Model No. TA 2714, and be steel with non-removable pins. Equivalent products by: Hager Companies, Ives Hardware, or Stanley Commercial Hardware, may be submitted for review. Comply with BHMA standard A156.1 criteria, for 5 knuckle butt hinges. Exterior doors, interior labeled doors and interior doors with closers shall have ball bearings. Hinges for lockable doors shall be furnished with a pin which cannot be removed when the door is closed.

2.9 CONTINUOUS HINGES

Hinges for any oversized door leaf shall be continuous-type, geared hinges. Basis of Design product is Roton 780 Series Heavy Duty Concealed Leaf Continuous Hinges as manufactured by Hager Companies. Use model 780-112HD at doors requiring 90 degree opening angle. Use model 780-041HD at doors which require greater than 90 degree opening angle. Substitutions which are fully compliant with these Specifications, as manufactured by McKinney, Pemco, or Stanley, may be submitted for approval.

2.10 ELECTRIC POWER TRANSFER HINGES

Hinges are to be manufactured by McKinney Products Company, Model No. CC-18 concealed circuit electric hinges, and be stainless steel with non-removable pins. Provide number of wires as required at each location; minimum of (2) of the wires at each location shall be 18 gauge. Equivalent products by: Hager Companies, Ives Hardware, or Stanley Commercial Hardware, may be submitted for review. Comply with BHMA standard A156.1 criteria, for 5 knuckle butt hinges. Exterior doors, interior labeled doors and interior doors with closers shall have ball bearings.

2.11 CLOSERS

Surface closers to be rack and pinion type with adjustable sweep and latch speeds controlled by key operated valves, with a forged steel main arm. Closer shall comply with BHMA A156.4 criteria and have a US32D finish. Closer size shall be compliant with manufacturer's recommendations; for the size of the door, exposure to weather, and anticipated frequency of use. Force required for pushing or pulling the door other than fire doors shall not exceed 5 lbs. maximum. Closers shall be adjusted so that from an open position of 90 degrees from the latch, the time required to move the door to a position of 12 degrees from the latch shall be 5 seconds minimum.

Provide products from one of the following (no substitutions), subject to compliance with referenced criteria.

- DORMA Architectural Hardware; (DORMA Group) Model Series 8900
- LCN Closers, (Ingersoll Rand), 4000 Series (Basis of Design)
- Sargent Manufacturing Company, (ASSA ABLOY Group) 281 Series
- Norton (ASSA ABLOY), 7500 Series (Owner preference – include in base bid)

Parallel arms shall be provided where necessary and with U.L. approved fusible link holder arm, set at 160ºF for U.L. labeled doors if automatic hold-opens are also provided. Where closers are indicated for both leaves of a double door, provide appropriate coordinator for specific installation condition.

2.12 DOOR STOPS

Door stops shall be one of the following types as manufactured by H. B. Ives, Wallingford, CT, and as scheduled on the Drawings. Furnish anchors suitable for the surface to receive the door stop. Verify wall-mounted stops are anchored to blocking in gypsum board partitions.

Floor stop shall be Model No. FS436 (doors without thresholds) and FS438 (doors with thresholds or undercut), dome type.

2.13 SURFACE MOUNTED BOLTS

Surface bolts to comply with BHMA A156.16 criteria, and have a US32D finish. Subject to compliance with referenced criteria, provide products from one of the following Manufacturers: Burns Manufacturing Inc., Door Controls International, Inc., Ives Hardware, Rockwood, and Trimco.

2.14 FLUSH MORTISED BOLTS

Manual Flush Bolts are to have a minimum 3/4 inch throw and be designed for mortising into the door edge. Mortised bolts shall comply with BHMA A156.16 criteria with exposed surfaces to have a US32D finish.
Provide products from the McKinney Products Company (ASSA Abloy Group) Model No. FB01M-5, and subject to compliance with referenced criteria. Equivalent products from the following manufacturers may be submitted for review.

- Burns Manufacturing Inc.
- Ives Hardware, (Ingersoll Rand Co.)
- Rockwood
- Trimco

Automatic and Self Latching Flush Bolts are to have a minimum 3/4 inch throw and be designed for mortising into the door edge. Provide dust-proof strike. Automatic and Self Latching bolts to comply with BHMA A156.16 criteria with exposed surfaces to have a US32D finish.

Provide products from the McKinney Products Company (ASSA Abloy Group) Model No. FB06M, subject with compliance to referenced criteria. Equivalent products from the following manufacturers may be submitted for review.

- Door Controls International, Inc.
- Ives Hardware, (Ingersoll Rand Co.)
- Rockwood
- Trimco
- Yale (Owner preference – include in base bid)

2.15 PROTECTIVE TRIM

Protective trim to comply with BHMA A156.6 criteria, and fabricated from 0.050 inch thick stainless steel, include manufacturer's standard machine or self-tapping screw fasteners.

Provide products from the McKinney Products Company (ASSA Abloy Group): Model No. KP50 for Kick Plates, Model No. P055 for Mop Plates, Model No. P055 for Push Plate (8" X 16"), and Model No. DP403 for Pull Plate (4" X 16"). Products are subject to compliance with referenced criteria. Equivalent products from the following manufacturers may be submitted for review.

- Burns Manufacturing Inc.
- Ives Hardware, (Ingersoll Rand Co.)
- Rockwood Manufacturing Co.
- Trimco
- Yale (Owner preference – include in base bid)

2.16 WEATHER STRIPPING

Weather stripping is to comply with BHMA A156.22 criteria, by Pemko Manufacturing Company. Provide Model No. 290 APK with Al finish. Reviewed equivalent products of Hager Company, National Guard Products or Zero International, may be submitted for review.

2.17 HEAD AND JAMB SMOKE SEALS

Head and jamb seals to comply with BHMA 156.22 criteria, to be Pemko Manufacturing Company, provide Model No. 335/336 AR AL finish extruded anodized aluminum seals. Reviewed equivalent products of Hager Company, National Guard Products or Zero International, may be submitted for review.

2.18 DOOR BOTTOM SEAL

Mortised door bottom seals to comply with BHMA 156.22A criteria, to be Pemko Manufacturing Company Model No. 420 APKL mortised extruded anodized aluminum seals. Reviewed equivalent products of the Hager Company, National Guard Products or Zero International, may be submitted for review.

Surface mounted bottom seals to comply with BHMA 156.22A criteria, to be Pemko Manufacturing Company Model No. 315 NA Al finish. Reviewed equivalent products of the Hager Company, National Guard Products or Zero International may be submitted for review.

2.19 ACOUSTICAL SEAL (Oxidation Air Blower Building Only)

Acoustial seals to comply with BHMA 156.22A criteria, to be Pemko Manufacturing Company STC SET 1D consisting of, Model 303AS screw applied gasket with silicone bulb, Model S44 adhesive back style gasket and Model STC411APK acoustic door bottom. Acoustical seals assembly shall provided STC rating of 30 or greater.

2.20 THRESHOLDS

Thresholds are to comply with BHMA A156.21 criteria, and be fabricated to full width of the required openings. Heavy duty thresholds shall be Pemko Manufacturing Co. (ASSA ALBOY Group), Inc., cast, 5 inch wide, aluminum with abrasive aggregate integrally cast into the surface, Model No. 1715A. Equivalent product may be submitted for review by one of the following: Hager Company, National Guard Products, Reese Enterprises, Inc., and Zero International. Locations of thresholds are shown on the hardware schedule.

2.21 DELIVERY

Delivery shall coincide with the Construction schedule to eliminate long term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the materials. Materials shall not be shipped until the hardware list and manufacturer's data sheets have been reviewed. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

2.22 FINISHES

Provide finishes complying with BHMA156.18 criteria. All finishes shall be US32D satin stainless steel, unless otherwise noted. Protect mechanical finishes on exposed surfaces by applying a strippable, temporary covering prior to shipping.

2.23 DOOR HARDWARE SETS:

Hardware Set 1 (HW-1)
Exterior, Single, Unrated Doors

Panic Exit Device w/ Accessible Pull-SideTrim (confirm lock function with Owner)
1 Cylinder as Required
1-1/2 Pair Butt Hinges
1 Closer
1 Overhead Stop
1 Heavy Duty Threshold
1 Drip Cap
1 Bottom Door Seal
1 Kick Plate (2" less than door width)
1 Set Weatherstripping
Silencers

Hardware Set 2 (HW-2)
Exterior, Single, Fire-Rated Opening Protectives

Panic Exit Device w/ Accessible Pull-Side Trim (confirm lock function with Owner)
1 Cylinder as Required
1-1/2 Pair Butt Hinges
1 Closer
1 Overhead Stop
1 Heavy Duty Threshold
1 Drip Cap
1 Bottom Door Seal
1 Kick Plate (2" less than door width)
1 Set Weatherstripping
Silencers

Hardware Set 3 (HW-3)
Exterior, Unrated, Coiling Overhead Doors

All Hardware by Coiling Door Supplier

Hardware Set 4 (HW-4)
Exterior, Coiling Overhead Doors: Fire-Rated Opening Protectives

All Hardware by Coiling Door Supplier

Hardware Set 5 (HW-5)
Interior, Single, Fire-Rated Opening Protectives

Panic Exit Device w/ Accessible Pull-Side Trim (confirm lock function with Owner)
1 Cylinder as Required
1-1/2 Pair Butt Hinges
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 6 (HW-6)
Exterior, Unrated, Double Doors

2 Panic Exit Devices, one with Accessible Exterior Trim (at active leaf: confirm lock function with Owner)
1 Cylinder as Required
3 Pair Butt Hinges
2 Closers
1 Coordinator
2 Overhead Stops
1 Set Automatic Flush Bolts
1 Dustproof Strike
1 Astragal
1 Heavy Duty Threshold
1 Drip Cap
1 Bottom Door Seal
2 Kick Plates (2” less than door width)
1 Set Weatherstripping
Silencers

Hardware Set 7 (HW-7)
Exterior, Fire-Rated, Double-Door Opening Protectives

2 Fire Exit Devices, one with Accessible Exterior Trim (at active leaf: confirm lock function with Owner)
1 Cylinder as Required
3 Pair Butt Hinges
2 Closers
1 Coordinator
2 Overhead Stops
1 Set Automatic Flush Bolts
1 Dustproof Strike
1 Astragal
1 Heavy Duty Threshold
1 Drip Cap

1 Bottom Door Seal
2 Kick Plates (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 8 (HW-8)
Interior, Fire-Rated, Double-Door Opening Protectives

2 Fire Exit Panic Devices, one with Accessible Exterior Trim (at active leaf: confirm lock function with Owner)
1 Cylinder as Required
3 Pair Butt Hinges
2 Closers
1 Coordinator
2 Overhead Stops
1 Set Automatic Flush Bolts
1 Dustproof Strike
1 Astragal
1 Bottom Door Seal
2 Kick Plates (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 9 (HW-9)
Interior, Coiling Overhead Doors: Fire-Rated Opening Protectives

All Hardware by Coiling Door Supplier

Hardware Set 10 (HW-10)
Interior, Single, Fire-Rated Opening Protectives at Non-Locking Rooms

Passage Set with Latch
1-1/2 Pair Butt Hinges
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 11 (HW-11)
Interior, Single, Fire-Rated Opening Protectives at Access-Controlled Doors

Panic Exit Device w/ Accessible Pull-Side Trim (Storeroom Function)
Electric Strike (by Others)
1 Power Supply (as Needed for Electric Strike) (by Others)
1 Cylinder as Required
Biometric hand scanner (by Others)
1 Power Supply (as Needed for Biometric Scanner) (by Others)
1-1/2 Pair Butt Hinges

1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 12 (HW-12)
Interior, Single, Unrated, Doors at Offices

Lockset (Office Function)
1 Cylinder as Required
1-1/2 Pair Butt Hinges
1 Wall Stop
1 Kick Plate (2” less than door width)
1 Set Dust Gaskets At Offices Other than in Administration Area
Silencers

Hardware Set 13 (HW-13)
Interior, Single, Unrated, Doors at Single Toilet Rooms

Privacy Set (Privacy Latch Function)
1-1/2 Pair Butt Hinges
1 Wall Stop
1 Kick Plate (2” less than door width)
Silencers

Hardware Set 14 (HW-14)
Interior, Single, Unrated Doors at Multi-Stall Toilet Rooms

1 Set Push / Pull Hardware
1-1/2 Pair Butt Hinges
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Dust Gaskets
Silencers

Hardware Set 15 (HW-15)
Interior, Double, Unrated, Door at Controlled Access Locations

Electromechanical Lockset (at Active Leaf: Storeroom Function) (by Others)
1 Cylinder as Required
1 Power Supply (as Needed for Lockset) (by Others)
Biometric Hand Scanner (by Others)
1 Power Supply (as Needed for Biometric Scanner) (by Others)
2-1/2 Pair Butt Hinges
1 Electric Power Transfer Hinge (at Active Leaf)
2 Closers

1 Coordinator
2 Overhead Stops
1 Set Automatic Flush Bolts
1 Dustproof Strike
1 Astragal
1 Bottom Door Seal
2 Kick Plates (2” less than door width)
1 Set Dust Gaskets
Silencers

Hardware Set 16 (HW-16)
Interior, Unrated, Coiling Overhead Door

All Hardware by Coiling Door Supplier

Hardware Set 17 (HW-17)
Interior, Single, Unrated Door at Labs

Panic Exit Device w/ Accessible Pull-Side Trim (Office Function)
1 Cylinder as Required
1-1/2 Pair Butt Hinges
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 18 (HW-18)
Interior, Single, Fire-Rated Opening Protective at Egress-Only Locations

Alarmed Panic Exit Device w/ No Pull-Side Trim (Storeroom Function, Egress Only)
1 Power Supply (As Needed for Alarmed Exit Device)
1 Cylinder as Required
1 Pair Butt Hinges
1 Electric Power Transfer Hinge
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Smoke Seals
Silencers

Hardware Set 19 (HW-19)
Exterior, Single, Unrated Door at Controlled Access Locations

Panic Exit Device w/ Accessible Pull-SideTrim (Storeroom Function)
Electric Strike (by Others)
1 Power Supply (as Needed for Electric Strike) (by Others)
1 Cylinder as Required

Biometric hand scanner (by Others)
1 Power Supply (as Needed for Biometric Scanner) (by Others)
1-1/2 Pair Butt Hinges
1 Closer
1 Overhead Stop
1 Heavy Duty Threshold
1 Drip Cap
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Weatherstripping
Silencers

Hardware Set 20 (HW-20)
Interior, Single, Unrated Door at Non-Locking Locations

Panic Exit Device w/ Accessible Pull-Side Trim (Latched, Passage Function)
1-1/2 Pair Butt Hinges
1 Closer
1 Wall Stop
1 Bottom Door Seal
1 Kick Plate (2” less than door width)
1 Set Dust Gaskets
Silencers

Hardware Set 21 (HW-21)
Interior, Double, Unrated, Doors at Non-Locking Locations

2 Panic Exit Devices, one with Accessible Exterior Trim (at active leaf: Passage Function)
3 Pair Butt Hinges
2 Closers
1 Coordinator
2 Overhead Stops
1 Set Automatic Flush Bolts
1 Dustproof Strike
1 Astragal
2 Bottom Door Seals
2 Kick Plates (2” less than door width)
1 Set Dust Gaskets
Silencers

Hardware Set 22 (HW-22)
Interior, Single, Unrated, Door at Non-Locking Locations

1 Panic Exit Device with Accessible Exterior Trim (Passage Function)
1-1/2 Pair Butt Hinges
1 Closers
1 Overhead Stops
1 Bottom Door Seal
1 Kick Plates (2” less than door width)
1 Set Dust Gaskets

Silencers

3.0 EXECUTION

3.1 HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored inside a building in a dry place.

3.2 SCHEDULING AND COORDINATING

Scheduling and coordinating of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.3 ACCEPTANCE OF OTHER WORK

Before beginning the installation of hardware materials, the Contractor shall inspect the doors and other installed work which may affect hardware installation. The Contractor shall inform the Owner's Representative of any conditions which would prevent proper hardware installation so that these items may be corrected. Beginning the installation of hardware materials shall indicate the Contractor's acceptance of doors and other installed work as being acceptable for the proper installation of hardware.

3.4 PRELIMINARY WORK

Preliminary work shall consist of inspecting the products for damage. Damaged products shall not be installed.

3.5 LOCK CYLINDERS

Install Construction cores to secure buildings and areas during the Construction period. Replace Construction cores with the permanent cylinder cores as directed by the Owner's Representative.

3.6 DOOR HARDWARE

Door hardware shall be installed in accordance with the hardware manufacturer's printed instructions and this Section. All hardware shall comply with manufacturer's templates and instructions for accessible installation to meet CBC 2013 11B-404. Operable parts of hardware shall be 34 inches minimum and 44 inches maximum above the finished floor or grade. Operable parts shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Hardware shall fit properly, provide smooth operation, and be located as follows:

3.6.1 Levers or other operator shall be centered 3 ft - $5^{13}/_{16}$ in. above finished floor.

3.6.2 Top and bottom hinges shall be centered no more than 10 inches from top and bottom of door, respectively.

3.6.3 Middle hinge shall be equidistant from the top and bottom hinges.

3.6.4 Closers shall be located on the interior side of exterior doors.

3.6.5 Door stops shall be located in line with a vertical line through the center of the knob at the point of contact.

3.6.6 Push plates shall be located with the center of the plate 40 inches above the finished floor.

3.6.7 Pull handles shall be located with the center of the handle 40 inches above finished floor.

3.6.8 Thresholds shall be coped to door jambs and be located where shown.

3.6.9 Weather stripping shall be located where scheduled.

3.6.10 Head and jamb sills shall be located where scheduled.

3.6.11 Door bottom seals shall be located where scheduled.

3.7 CLEANING AND PROTECTION

Cleaning and protection of installed hardware shall be the responsibility of the Contractor until the project has been accepted by the Owner. Hardware shall be protected from damage by other trades during Construction. Damaged installed hardware shall be removed and replaced with new hardware by the Contractor at no additional cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**JOINTS AND SEALANTS**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1508**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 079200

JOINTS AND SEALANTS

1.0 GENERAL

1.1 SCOPE

Work under this section includes all materials, labor, equipment and services for joint sealers in accordance with the Drawings, Construction Specifications and Scope of Work Document.

1.2 PUBLICATIONS AND STANDARDS

- Government Services Administration (GSA), Commercial Item Description (CID): GSA CID A-A-272A-Sealing Compound; Silicone Rubber Base (For Caulking, Sealing, and Glazing in Buildings and Other Structures).
- Federal Specification TT-S-00230C: Sealing Compound; Rubber Base, Single Component (for caulking, sealing, and glazing in building Construction)
- ACI 504 R – Guide to Joint Sealants for Concrete Structures
- ASTM C834 – Standard Specification for Latex Sealants
- ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications
- ASTM C920 – Standard Specification for Elastomeric Joint Sealants
- ASTM C1193 – Standard Guide for Use of Joint Sealants
- ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber
- SWRI (Sealant, Waterproofing and Restoration Institute) - Sealant and Caulking Guide Specification

1.3 SUBMITTALS

1.3.1 Manufacturer's printed data sheets shall show the materials to be used, including sealants, joint backing materials, bond breakers, and primers, for the specific uses required.

1.3.2 Certificates shall be notarized and shall certify that the joint sealer materials furnished comply with the specified design and material requirements.

1.3.3 All work under this section shall be performed by a Contractor approved by the manufacturer of the joint sealer materials used. Manufacturer's approval shall be submitted in writing before commencement of work.

1.4 GENERAL REQUIREMENTS

The materials for and installation of all joint sealers shall conform to this specification, the recommendations of the materials manufacturer, the applicable referenced Standards for each material, and the Federal Specification referenced.

1.5 TESTING

In the event that the Owner questions the joint sealer materials or installation, he will engage a testing laboratory to determine the condition of the joint sealer. If the tests show that the joint sealer complies with the Specifications, the Owner shall bear the costs of the testing and of any repairs of damage to the joint sealer caused by the testing. If the tests show that the joint sealer does not comply with the Specifications, the Contractor shall bear the cost of the testing and shall make the joint sealer comply with the Specifications at no additional cost to the Owner.

2.0 PRODUCTS

2.1 GENERAL

All materials used shall be subject to review. All materials shall be the products of one manufacturer. Materials specifically named are specified to establish standards of quality. Equivalent products of other manufacturers which conform to the requirements of this specification may be submitted for review.

2.2 SINGLE (ONE) COMPONENT SILICONE (for surfaces not receiving paint)

Single (One) component silicone sealant material shall comply with Federal Specification TT-S-00230C and be a non-sag compound for caulking joints in vertical and horizontal non-traffic bearing surfaces that do not require field painting. Material shall be one of the following products, or reviewed equivalent:

Manufacturer	Product
Pecora Chemical Corporation	864NST Silicone
Sonneborn	Omniseal 50
Dow Corning Corporation	791 Silicone
G. E. Silicones	Silpruf SCS2000
Sika	Sikasil-N plus
Tremco	Spectrem 2

2.3 SINGLE (ONE) COMPONENT POLYURETHANE (for surfaces to be field painted)

One-component polyurethane sealant material shall comply with Federal Specification TT-S-00230C and shall be a non-sag compound for caulking joints in vertical and horizontal non-traffic bearing surfaces. Material shall be one of the following products, or reviewed equivalent:

Manufacturer	Product
Pecora Chemical Corporation	Dynatrol 1-XL
Sonneborn	Sonolastic NP1
Bostik	Chem-Calk 900
Tremco	Dymonic
Sika	Sikaflex-227

2.4 AUXILIARY MATERIALS

Auxiliary Materials including joint backing materials, bond breakers, primers, and joint cleaning materials shall be those recommended by the sealant manufacturer for the specific conditions required.

2.5 DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. Materials shall not be shipped until the manufacturer's data sheets have been reviewed, and the notarized certificates and approvals have been furnished. Sealants shall not be allowed to freeze. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

3.0 EXECUTION

3.1 HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage or deterioration.

3.2 SCHEDULING AND COORDINATING

Scheduling and coordinating of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.3 ACCEPTANCE OF OTHER WORK

Before beginning the installation of joint sealer materials, the Contractor shall inspect other installed work which may affect the joint sealer work. The Contractor shall inform the Owner's Representative of any conditions which would prevent the proper installation of joint sealer so that these items may be corrected. Beginning the installation of joint sealer materials shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of joint sealer.

3.4 PRECAUTIONS

Joint sealers shall not be installed when the ambient temperature or the surface of the material to receive joint sealers is colder than 40ºF. Masking tape shall be applied along each side of joints after primer, where used, has dried; and removed immediately after the bead is finished before surface skin starts to form. Masking tape shall not be applied to surfaces which are to receive joint sealers. Safety measures recommended by the joint sealer manufacturer shall be followed.

3.5 JOINT PREPARATION

Joint preparation shall comply with the joint sealer manufacturer's printed instructions. Dirt, oil, grease, frost, water, corrosion, cement, mortar, mill scale, and other contaminants shall be removed from surfaces to receive joint sealer. Joints, if deeper than the limits recommended by the joint sealer manufacturer, shall have dimensions rectified through the use of backer rod meeting the approval of the sealant manufacturer. Bond breaker shall be applied to the recessed surface of joints not requiring backing. Primer shall be applied to those surfaces requiring primer, and allowed to thoroughly dry before the joint sealer is applied.

3.6 JOINT SEALER

Joint sealer shall be forced firmly into the joint and pressed against the back and sides to completely fill the joint. The exposed surface of the joint sealer shall be uniform in width, and smoothed in accord with the joint sealer manufacturer's printed instructions, to present a smooth surface free of voids, bubbles, ridges and waves. Surfaces adjoining joints shall be free from smears and soils resulting from joint sealers operations. Joint sealer shall be applied around door frames, framed openings in walls, louvers, exterior joints subject to weather penetration, and all locations indicated on the Drawings.

3.7 CLEANING AND PROTECTION

Cleaning and protection of joint sealers shall be the responsibility of the Contractor until the project has been accepted by the Owner. Joint sealers shall be protected from damage by other trades during Construction and from rain, ice, snow, windblown dust, and other foreign matter until the surface skin has cured. Damaged material shall be removed, joints prepared again, and resealed.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**HOLLOW METAL DOORS AND FRAMES**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1509**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 081113

HOLLOW METAL DOORS AND FRAMES

1.0 **GENERAL**

1.1. SCOPE

Work under this section includes all materials, labor, equipment, and services for hollow metal doors and frames in accordance with the Drawings, Construction Specifications and Scope of Work Documents.

1.2 RELATED SPECIFICATION SECTIONS

- DOOR HARDWARE, Specification 143993-ASA-DD3-SPC-1507

1.3 PUBLICATIONS REFERENCED HEREIN

- ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
- American National Standards Institute (ANSI), current edition of Standards named
- American Society for Testing and Materials (ASTM), current edition of Standards named
- Underwriters' Laboratories, Inc. (U.L.), Building Materials Directory and Labeling Service

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership, or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and Scope of Work Document.

1.4.2 Owner’s Representative. The authorized Representative of the Owner.

1.4.3 Architect. The Architect is:

Wood
30 Patewood Ave
Greenville, SC

1.4.4 Others. Any vendor, Contractor, etc., other than the Contractor and Owner herein defined.

1.4.5 Gauges. Thickness of metal sheets as expressed in decimal fractions of one inch. Gauge decimal thicknesses vary based upon type of metal.

1.5 SUBMITTALS

1.5.1 Shop Drawings shall show elevations, metal thickness, hardware reinforcing and locations, typical construction of all products, the jobsite location, opening designation of each door and frame, and other data necessary to show compliance with the contract documents.

1.5.2 Manufacturer's Data Sheets for each type of door and each type of frame provided shall be included with the Shop Drawings.

1.6 GENERAL REQUIREMENTS

The materials for and installation of all hollow metal doors and frames shall conform to this Specification and the recommendations of the materials manufacturer.

2.0 PRODUCTS

2.1 GENERAL

2.1.1 All materials used shall be subject to review.

2.1.2 All doors and frames shall be the products of one manufacturer. Manufacturers specifically named are specified to establish standards of quality. Equivalent products of other manufacturers which conform to the requirements of this Specification may be submitted for review.

2.1.3 Frames for fire rated doors shall bear the U.L. label for the same rating as the doors.

2.1.4 Frame accessories, including appropriate wall anchors as recommended by the manufacturer for each type of wall condition, shall be provided.

2.2 REFERENCED MANUFACTURERS

2.2.1 Referenced manufacturers are Curries/Ceco Door, Republic Doors and Frames, Steelcraft, and Pioneer Industries.

2.3 DOORS

Doors for interior locations shall be full flush type constructed of two (2) outer sheets not lighter than 0.0598 inch thick (16 gauge) leveled steel conforming to ASTM A366, and laminated to a honeycomb core or reinforced with metal stiffeners. Welds exposed to view shall be dressed flush, smooth, and neat. Tops and bottoms shall be sealed against water penetration. Doors shall be reinforced at hinge points with 0.1345 inch thick (10 gauge) steel, at closers with 0.1046 inch thick (12 gauge) steel, and at all other points with 0.0747 inch thick (14 gauge) steel.

Doors for exterior locations shall be full flush type constructed of two (2) outer sheets not lighter than 0.0635 inch thick (16 gauge) leveled galvanized steel conforming to ASTM A653, and laminated to an insulated core. Welds exposed to view shall be dressed flush, smooth, and neat. Tops and bottoms shall be sealed against water penetration. Doors shall be reinforced at hinge points with 0.1345 inch thick (10 gauge) steel, at closers with 0.1046 inch thick (12 gauge) steel, and at all other points with 0.0747 inch thick (14 gauge) steel. Oversized doors shall be constructed of face sheets of not lighter than 0.0785 inch thick (14 gauge) leveled galvanized steel sheet.

2.4 DOOR SOUND TRANSMISSION (OXIDATION AIR BLOWER BUILDING ONLY)

Doors shall provide STC rating of 30 or greater. Acoustical assemblies shall be third-party, independently tested under the ASTM E90, ASTM E1332, ASTM E2235, ASTM E413, SDI 128, and HMMA 865 criteria. Referenced manufacturer Ceco Door, Sound Tech Xpress System.

2.5 LABELED DOORS

Labeled doors shall be of the full flush type constructed to conform with the Underwriters' Laboratories, Inc. specific requirements, and in compliance with current fire rating procedures. Labeled doors shall bear the Underwriters' Laboratories, Inc. label on the hinge edge for the rating required. Labeled double doors shall have an over-lapping rolled steel astragal on the active leaf.

2.5. DOOR PREPARATION FOR HARDWARE

Preparation for hardware shall comply with ANSI Standards A115.1, .2, .3 or .4 as applicable. The door manufacturer shall mortise, reinforce, drill, and tap the doors for hardware using the pattern templates, or samples, of the actual hardware furnished by the hardware manufacturer. The location of hardware is specified in the DOOR HARDWARE Section 143993-ASA-DD3-SPC-1507. Hardware provisions for U.L. labeled doors shall comply with U.L. requirements.

2.6. LOUVERS

Louvers, where indicated in the Door Schedule, shall be factory installed, fixed blade, inverted “V” type, fabricated from not less than 0.0635 inch thick (16 gauge) galvanized steel sheet, and having a minimum of 40% free air space. Louvers shall not project beyond the door faces.

2.7 FRAMES

2.7.1 Unless noted specifically otherwise, all frames provided shall be double-rabbet profiles.

2.7.2 All frames provided at exterior locations, and at other locations as identified on the Door Schedule, shall be galvanized steel.

2.7.3 Minimum gauge for any non-galvanized frame is 0.0598 inch thick (16 gauge); where door leaves larger than 3’-0” x 7’-0” are called for, provide minimum 0.0747 inch thick (14 gauge) frames. At oversized doors, refer to Drawings and Specifications for continuous hinge requirements.

2.7.4 Minimum gauge for any galvanized steel frame is 0.0635 inch thick (16 gauge); where door leaves larger than 3’-0” x 7’-0” are called for, provide minimum 0.0785 inch thick (14 gauge) frames. At oversized doors, refer to Drawings and Specifications for continuous hinge requirements.

2.7.5 Provide knock-down frames at gypsum board locations; provide epoxy bonding compound to fill corner joints and grind smooth after installation.

2.7.6 Provide welded-corner frames at CMU locations and in locations of steel channel framing.

2.7.7 Back-treat all frame interior surfaces with bitumen coating prior to grouting solid.

2.7.8 Provide silencers for all frames. Grout frame, fit hardware, and hang door with silencers in place. Remove unclean silencers for final finishing, then replace with new silencers after painting.

2.8 FRAME PREPARATION FOR HARDWARE

Preparation for hardware shall comply with ANSI Standards A115.1, .2, .3 or .4 as applicable. The frame manufacturer shall mortise, reinforce, drill and tap the frames for hardware using the pattern templates, or samples, of the actual hardware furnished by the hardware manufacturer. Door frames shall be reinforced at hinge points with 0.1793 inch thick (7 gauge) steel and shall include transom bars and mullions where indicated on the Drawings. The types and location of hardware are specified in the DOOR HARDWARE Section 143993-ASA-DD3-SPC-1507.

2.9 SHOP PRIMING

Shop priming shall consist of cleaning, filling, and grinding smooth; bonderizing; and applying a coat of the manufacturer's standard baked-on primer to all door and frame surfaces and edges, including hardware recesses.

2.10 DELIVERY

Delivery shall coincide with the erection schedule to eliminate long term storage at the site. Wrapping, marking and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. Materials shall not be shipped until the Shop Drawings have been reviewed. Delivery of damaged materials, which cannot be completely corrected by paint touch-up, shall not be accepted. Damaged material shall be immediately replaced with new material.

3.0 EXECUTION

3.1 Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored, after inspection for damage, in the manufacturer's shipping container.

3.2 Scheduling and coordinating of work specified in this section with that specified in other sections shall be the responsibility of the Contractor.

3.3 SHOP PAINT TOUCH-UP

Scratched areas and/or mild surface rust, which can be completely corrected by paint touch-up, shall be cleaned to bare metal and recoated with the same type paint used for the shop finish immediately after delivery to the jobsite.

3.4 ACCEPTANCE OF OTHER WORK

Before beginning the installation of frames, the Contractor shall inspect other installed work which may affect frame installation. The Contractor shall inform the Owner's Representative of any conditions which would prevent proper frame installation so that these items may be corrected. Beginning the installation of frames shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of the frames.

Before beginning the installation of doors, the Contractor shall inspect other installed work which may affect door installation. The Contractor shall inform the Owner's Representative of any conditions which would prevent proper door installation so that these items may be corrected. Beginning the installation of doors shall indicate the Contractor's acceptance of other installed work as being acceptable for the proper installation of the doors.

3.5 FRAME INSTALLATION

Frame installation and working hardware shall comply with the door manufacturer's printed instructions. Hardware locations and requirements are specified in the DOOR HARDWARE Specification 143993-ASA-DD3-SPC-1507 and shown on the Drawings in the door schedule. After fitting, hardware shall be removed, the field finish specified in PAINTING AND COATING Specification 143993-ASA-DD3-SPC-1510 applied, the hardware refitted and the finished door hung. All frame surfaces, including faces, edges, and hardware recesses shall be completely field painted before the hardware is refitted and the door is hung.

3.6. DOOR INSTALLATION

Door installation and reinforcements for hardware shall comply with the door manufacturer's printed instructions. Hardware locations and requirements are specified in the DOOR HARDWARE Specification 143993-ASA-DD3-SPC-1507 and shown on the Drawings in the door schedule. Door clearances, unless otherwise required for U.L. labeled doors, shall be approximately 3/32 inch at jambs 1/8 inch at heads, and not less than 1/4 inch nor more than 1/2 inch at floors (including thresholds). Clearances shall be adjusted as required for special hardware. After fitting, hardware shall be removed, the field finish specified in PAINTING AND COATING Specification 143993-ASA-DD3-SPC-1510 applied, the hardware refitted, and the finished door hung. All door surfaces, including faces, edges, and hardware recesses shall be completely field painted before the hardware is refitted and the door is hung. The finished door installation shall provide smooth and easy operation without binds, warps, or squeaks.

3.7 CLEANING AND PROTECTION

Cleaning and protection of installed frames and doors shall be the responsibility of the Contractor until the project has been accepted by the Owner. Frames and doors shall be protected from damage by other trades during Construction. Damaged installed doors and frames shall be removed and replaced with new doors and/or frames by the Contractor at no additional cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**PAINTING AND COATING**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1510**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

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A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
0	ISSUED FOR DESIGN	GJB	BEA	MGW	DH	28MAY21

Permit Stamp

Architect's Seal

SECTION 099000

PAINTING AND COATING

1.0 GENERAL

1.1. SCOPE

Work under this section includes all materials, labor, equipment, and services for surface preparation and field painting in all plant areas in accordance with the Drawings, Construction Specifications, and Scope of Work Document.

1.2. PUBLICATIONS REFERENCED HEREIN

- Steel Structures Painting Council (SSPC), Specifications
- American National Standards Institute (ANSI), standards named
- National Association of Corrosion Engineers (NACE), standards named
- International Concrete Repair Institute (ICRI), standards named
- Occupational Safety and Health Administration (OSHA) 29CFR 1910.1200(g) and Appendix D.
- Process Industry Practices (PIP) CTSC 1000 Application of Coatings to Concrete
- Process Industry Practices (PIP) CTSE1000 Application of External Coatings
- United Nations Globally Harmonized System of Classification and labelling of Chemicals (GHS).

1.3. DEFINITIONS

1.3.1. *Dry Film Thickness (DFT).* The thickness, measured in mils, of a completely cured paint film.

1.3.2. *Paint Coverage.* The number of square feet to be covered by one gallon of paint expressed as sf/gal.

1.3.3. *Contractor.* Company, partnership or corporation responsible for providing the painting and all scope of work defined herein.

1.3.4. *Owner.* The Owner is Big Rivers Electric Corporation.

1.3.5. *Owner's Representative.* The authorized representative of the Owner.

1.4. QUALITY CONTROL

The Contractor shall be responsible for providing and implementing a quality control, inspection, and testing program which is adequate to assure compliance with the Specifications. Details to be reviewed by the Owner and Owner's Representative.

CONTRACTOR QUALIFICATION

Contractor shall be SSPC certified for the applicable painting system(s), as follows: SSPC QP1 certification for surface preparation and industrial coating field application on steel structures. SSPC QP8 certification for surface preparation and industrial coating application on concrete surfaces. SSPC QP9 certification for field application of architectural coatings. Contractor shall obtain certification from SSPC by fulfilling the

requirements found on the SSPC website: https://www.sspc.org/qp-for-contractors/. Certification is achieved through the documentation of work history, quality control, safety, and environmental compliance programs and procedures, and passing a subsequent audit by SSPC and requires approximately one-to-two months for the process to be completed.

1.5. SUBMITTALS

1.5.1. PRODUCT CERTIFICATION

The Contractor shall furnish with his proposal a notarized certificate from the paint Manufacturer, certifying that his products comply with this Specification and will produce uniform compatible paint systems tightly bonded to the specified surfaces if applied in accordance with these Specifications.

1.5.2. PAINT COLOR SAMPLES

Four sets of the Manufacturer's standard color samples and samples of any special colors required by the Owner shall be furnished to the Owner's Representative for review of the finish paint colors and sheens to be used.

1.5.3. INSPECTION REPORTS

Reports by the paint Manufacturer of their visits at the intervals required to assure proper quality control shall be made to the Owner's Representative reporting on the degree of cleaning, application techniques, paint adhesion, paint curing, dry-film thickness or coverage, and any pertinent comments or recommendations.

1.6. GENERAL REQUIREMENTS

1.6.1. The materials for and installation of all painting shall conform to this Specification, the recommendations of the materials Manufacturer and the following additional requirements:

- Painting of carbon steel surfaces shall be performed in conformance with the procedures detailed in the Steel Structures Paint Council Manual (SSPC).
- In case of difference between the referenced standards and these Specifications, the one having the more stringent requirements shall govern.
- *Volatile Organic Compounds (VOC).* The products specified herein have a VOC not exceeding 3.5 pounds of volatile organic compounds for each gallon of product, according to the Manufacturers' published literature.
- The VOC emission level permitted in different localities is dependent on the federal, state, and local regulations legislated for that particular locality.
- The Contractor is responsible for notifying the Owner's Representative if lower VOC limits than those of the paints specified are required in the locality where the painting work will be done.
- If lower VOC levels are required the Contractor shall submit with his proposal a list of alternate materials which he proposes to use and which do comply with the VOC emission limits required.

1.6.2 Alternate materials proposed shall be of the same generic types as the specified materials and shall be, as much as possible, the products of one Manufacturer.

1.6.3 Alternate materials proposed for any single paint system must be the products of one Manufacturer. Complete Manufacturers' data, including VOC, shall be submitted for each alternate material proposed.

1.7 TESTING

In the event that the Owner questions the paint work, the Owner will engage a testing laboratory to determine the condition of the painting. If the tests show that the paint work complies with the Specifications, the Owner shall bear the costs of the testing and of any repairs of damage to the painting caused by the testing. If the tests show that the paint work does not comply with the Specifications, the Contractor shall bear the cost of the testing and shall remediate the paint work to fully comply with the Specifications, at no additional cost to the Owner.

2.0 PRODUCTS

2.1 MANUFACTURER

Except where specified otherwise by name, the products of International Paint, Carboline, PPG, and the Sherwin-Williams Company are named to establish standards of quality. Equivalent products of other Manufacturers may be submitted for review. All materials shall be proven, proprietary products selected from the Manufacturer's standard paint product lines with an expected paint coating life of 5 years or more, unless noted otherwise. Colors shall be selected by the Owner's Representative. The Owner's Representative shall decide the equality of proposed materials. When substitutions are proposed for the specified zinc-rich coatings, such products shall contain a minimum of 81% pure zinc dust by weight of dry film thickness.

2.2 GENERAL

All paints, primers, stains, paste fillers, thinners, and similar materials shall be delivered in the original sealed containers which show the designated name, formula or Specification number, batch number, color, date of manufacture, shelf life, Manufacturer's directions, recommended thinners, and the name of the Manufacturer, all of which shall be legible at the time of use. Paint shall arrive on the job ready-mixed except for multi-component zinc-rich materials, catalyzed materials, tinting of undercoating and possible thinning. Containers shall be no larger than five gallon capacity. Paint thinning solvents shall be the type recommended by the paint Manufacturer and shall be received in individual sealed containers. Mixing and straining paint products shall be in compliance with the paint Manufacturer’s instructions.

Clean up solvents shall be those recommended by the paint Manufacturer for the uses required. Any paint or thinner that has become contaminated shall not be used. Paints that have been catalyzed shall not be used after the expiration of the pot life time recommended by the Manufacturer for the temperature and other conditions at the time of application.

2.3 DELIVERY

Delivery shall coincide with the erection schedule to eliminate long-term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner which will prevent damage and clearly identify the material. Materials shall not be shipped until the color samples have been reviewed, and the notarized certificates have been furnished. Delivery of contaminated products or products in containers damaged to the point of the

products being contaminated shall not be accepted. Damaged material shall be immediately replaced with new material.

2.4 HANDLING

Submit Globally Harmonized System (GHS) Safety Data Sheets (SDS) to Owner for all products brought onto the job site. Deliver coatings to shop or job site in original, unopened containers with labels intact. Container with minor damage may be used if not punctured and lid seal is unbroken.

2.4.1 Marking: Clearly mark or label containers to show coating identification, including:

- Supplier's name
- Brand name
- Lot Number
- Brand Code
- Coverage
- Surface Preparation requirements
- Drying Time
- Clean-up requirements
- Color Designation
- Instructions for mixing and reducing
- Date of manufacture
- Shelf life
- Analysis of contents
- Identification of toxic substances
- Additional Special instructions

2.4.2 Do not open coating containers until required for use.

2.4.3 Except for thixotropic materials, do not use coatings that have livered, gelled, or otherwise deteriorated during storage.

2.4.4 Thixotropic materials that can be stirred to attain normal consistency may be used.

2.5 STORAGE

Store paint materials at minimum ambient temperature of 45ºF and a maximum of 90ºF in ventilated area, and as required by supplier's instructions. Use the oldest coating of each kind first. Use coating before its shelf life has expired.

2.6 PAINTING SYSTEMS

The following list of paint systems specifies the use, surface preparation, touch-up where required, types and number of coats, and coating dry film thickness (DFT) or coverage in square feet per gallon (sf/gal) required. Some, but not necessarily all, of the paint systems listed are required for the project. Where surfaces identified under "Use" do not occur in the project, the paint system identified by that "Use" is not required. Surface preparation types per this Specification, Paragraph 2.7. Touch-up types per this Specification, Paragraph 2.8.

2.6.1 *System FM-1. (8-mil min., 2-coat system, in areas not exposed to sunlight)*

- **Use**: Unprimed ferrous metal surfaces not exposed to sunlight, unprimed metal surfaces exposed to plant operating areas, unprimed ferrous metal surfaces of

uninsulated piping and valves (excluding ferrous metal items embedded in concrete or masonry).

- **Surface Preparation**: Type A
- **Touch-up**: Type 1
- **Description**: Primer shall be catalyzed, polyamide-cured, organic, zinc rich, epoxy paint with DFT of 2 to 3 mils. The finish coat shall be high build, catalyzed, polyamide-cured, epoxy paint with DFT of 5 to 6 mils, unless otherwise specified. Minimum total DFT shall be 8 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Amercoat 68HS	Amerlock 2/400	PPG
Zinc Clad IV B69 A8/B69 V8	Macropoxy 646 Fast Cure Epoxy Hi-Solids Polyurethane	The Sherwin-Williams Co.
Carbozinc 859	Carboguard 60	Carboline

2.6.1.1 *System FM-1A. (8-mil minimum, 2-coat system, insulated ducts, valves, and piping with operating temperatures less than or equal to 300 deg. F)*

- **Use**: Unprimed ferrous metal surfaces not exposed to sunlight, unprimed metal surfaces with insulation exposed to plant operating areas, unprimed ferrous metal surfaces of insulated ducts, piping, and/or valves with temperatures less than or equal to 300 deg. F.
- **Surface Preparation**: Type A1
- **Touch-up**: Type 1
- **Description**: Primer and finish coat shall be a modified epoxy phenolic coating with DFT of 4 mils each for a total minimum DFT of 8 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Amercoat 90HS	Amercoat 90HS	PPG
Intertherm 228	Intertherm 228	International Paint
Thermaline 400	Thermaline 400	Carboline

2.6.2 *System FM-2. (10-mil min,. 3-coat system, in areas exposed to sunlight)*

- **Use**: Exterior unprimed ferrous metal surfaces, unprimed ferrous metal surfaces of uninsulated piping and valves (excluding ferrous metal items embedded in concrete or masonry).
- **Surface Preparation**: Type A1

- **Touch-up**: Type 1
- **Description**: Primer shall be a solvent-based, three component, inorganic ethyl silicate, zinc rich coating, with 2 to 4 mils DFT. Intermediate coat with 3 to 6 mils DFT. The finish coat is to be with 3 to 4 mils DFT. Provide the following combination of product (on a properly prepared surface, or an approved equivalent).

Primer	Intermediate	Finish Coat	Manufacturer
Zinc Clad II Plus (inorganic zinc-rich coating)	Macropoxy 646	Hi-Solids Polyurethane	Sherwin-Williams
Carbozinc 11 HS or 11 VOC	Carboguard 60	Carbothane 134 HG	Carboline
Interzinc 22	Interguard 475HS	Interthane 990	International Paint
Dimetcote-9H	Amerlock 2/400	Amercoat 450H	PPG

2.6.3 *System FM-3. (7-mil min., 2-coat system, in areas not exposed to sunlight)*

- **Use**: Interior shop primed ferrous metal surfaces exposed to plant operating areas.
- **Surface Prep**: Type C
- **Touch-Up**: Type 1
- **Description**: When the shop applied primer is incompatible with the succeeding coats, apply 2 to 3 mils DFT of universal alkyd primer coat. When the shop applied primer coat is compatible with the succeeding coats, no primer coat is required. The finish coat shall be high build, catalyzed, polyamide-cured, epoxy paint with DFT of 5 to 6 mils, unless otherwise specified. Minimum total DFT shall be 7 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Multi-Prime 94-258	Amerlock 2/400	PPG
Kem Kromik Univ. Primer B50 NZ6	Macropoxy 646	The Sherwin-Williams Co.
Carbocoat 150 Universal Primer	Carboguard 60	Carboline

2.6.4 *System FM-4. (5-mil min., 2-coat system, in areas exposed to sunlight)*

- **Use**: Exterior shop primed ferrous metal surfaces.

- **Surface Prep**: Type C
- **Touch-Up**: Type 1
- **Description**: When the shop applied primer is incompatible with the succeeding coats, apply 2 to 3 mils DFT of universal alkyd primer coat. When the shop applied primer is compatible with the succeeding coats, no primer coat is required. The finish coat shall be Urethane paint with 3 to 4 mils DFT. Minimum total DFT shall be 5 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Multi-Prime 94-258	Amercoat 450H	PPG
Kem Kromik Univ. Primer B50 NZ6	Hi-Solid Polyurethane B65 300 Series	Sherwin-Williams
Carbocoat 150 Universal Primer	Carbothane 134	Carboline

2.6.5 *System FM-5A (2 Coat System) Atmospheric Exposure to Chemicals and/or Elevated Temperature*

- **Use:** Shop primed or unprimed ferrous metal surfaces exposed to plant operation areas that include atmospheric exposure to chemicals and/or dry elevated temperatures up to 250 degrees F. Chemical and temperature resistance varies with product and may include water, fuels, most solvents, most alkalies, acids, sulfuric acid, or chlorine dioxide.
- **Surface Prep:** A1
- **Touch Up:** Type 1
- **Description:** . Apply primer coating at 16.0 to 20.0 mils DFT. Apply the finish coating at 16.0 to 20.0 mils DFT. One of the following products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Plasite 4301 HT or Plasite 4550-S	Plasite 4301 HT or Plasite 4550	Carboline
Interline 1064	Interline 1064	International Paint
Novaguard 4801	Novaguard 4801	PPG

2.6.6 *System FM-5B (2 Coat System) Interior Tank Lining – Immersion Service*

- **Use:** Shop primed, or unprimed ferrous metal interior tank lining surfaces with immersion service exposed to chemicals and/or elevated temperatures up to 194 degrees F. Chemical and temperature resistance varies with

product and may include nonpotable water, selected aromatic and aliphatic solvents, caustic solutions, crude oil, unleaded gasoline blends, MTBE, jet fuels. Consult Manufacturer for specific product chemical and temperature resistance for immersion service.

- **Surface Prep:** A2 for Plasite 4301HT, A1 for Plasite 4550-S, Interline 1064, and Novaguard 4801.
- **Touch Up:** Type 1
- **Description:** . Apply primer coating at 16.0 to 20.0 mils DFT. Apply the finish coating at 16.0 to 20.0 mils DFT. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Plasite 4301 HT or Plasite 4550-S	Plasite 4301 HT or Plasite 4550	Carboline
Interline 1064	Interline 1064	International Paint
Novaguard 4801	Novaguard 4801	PPG
Cor-Cote Vinyl Ester Primer	Cor-Cote Ven FF with Wax Solution	The Sherwin-Williams Co.

2.6.7 *System FM-5C (2 Coat System) – Interior Tank Lining – Immersion Service – Potable Water*

- **Use:** Shop primed or unprimed ferrous metal interior tank lining surfaces with immersion service exposed to potable water in accordance with NSF/ANSI 61 requirements or exposed to chemicals. Chemical resistance varies by product and may include nonpotable water, selected aromatic and aliphatic solvents, caustic solutions, crude oil, unleaded gasoline blends, MTBE, jet fuels. Consult Manufacturer for specific product chemical and temperature resistance for immersion service.
- **Surface Prep:** A1
- **Touch Up:** Type 1
- **Description:** For Potable Water Immersion Service see the applicable ANSI/NSF 61 Certification for the products listed and tank size limitations: For Interseal 670 HS, Interline 850, and Amercoat 133, apply primer coating at 4.0 to 6.0 mils DFT and finish coat at 4.0 to 6.0 mils DFT per coat for a total thickness of 10.0 mils DFT. For Carboguard 891 HS, apply primer coating at 6.0 to 10.0 mils DFT and apply the finish coating at 6.0 to 10.0 mils DFT for total DFT of 16.0 to 20.0 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Carboguard 891 HS	Carboguard 891 HS	Carboline
Interseal 670 HS or Interline 850	Interseal 670 HS or Interline 850	International Paint
Amercoat 133	Amercoat 133	PPG

2.6.8 *System FM-6 (Touch-up / Repairs Only)*

- **Use**: Damaged shop prime of finished painted ferrous metal surfaces.
- **Surface Prep**: Type C
- **Touch-Up**: Type 1

2.6.9 *System FM-7. (4 to 4.5 mil, 2-coat system for high temperature surfaces)*

- **Use**: Unprimed ferrous metal surfaces having a maximum temperature range from 250° F to 450° F. Primer and finish coats shall be shop-applied.
- **Surface Prep**: Type A1
- **Description**: Primer shall be a high solids silicone acrylic or inorganic zinc with a minimum 2.5 to 3 mil DFT. Finish coat shall be a high solids, silicone acrylic, heat resistant gloss paint with DFT of 1-1½ for mils for Thermaline 4900 and Intertherm 875 and a DFT of 2 mils for High Temp 500 V. Total thickness shall be 4 mils DFT for the Thermaline and Intertherm system and 4.5 mils for the Hi-Temp system. The following products, or an approved equivalent, shall be used. NOTE: Use 2 coats of primer (no finish coat) for insulated ductwork and insulated piping.

Primer Coat	Finish Coat	Manufacturer
Kem Hi-Temp Heat Flex II 450	Kem Hi-Temp Heat Flex II 450	Sherwin Williams
Thermaline 2977 VOC	Thermaline 4900 VOC	Carboline
Interzinc 22	Intertherm 875	International Paint
Dimetcote 9H	Hi-Temp 500V	PPG

2.6.10 *System FM-8. (2-coat system for high temperature surfaces)*

- **Use:** Unprimed ferrous metal surfaces having a maximum temperature range from 450° F to 1000° F.
- **Surface Prep:** Type A1
- **Description**: Primer coat shall be a one component, high solid, heat-resistant paint. Finish coat shall be a one component, 100% silicone resin, heat-resistant

paint. See primer and finish DFT listed below. Total DFT shall be 8.5 mils for Hi-Temp and Thermaline systems, and 3 to 4 mils for the Intertherm system. The following products, or approved equivalents, shall be used.

Primer Coat	Finish Coat	Manufacturer
Hi-Temp 1027 (5 to 6 mils)	Hi-Temp 1000VS Series (2 to 2.5 mils)	PPG
Heat Flex Hi-Temp 1200	Heat Flex Hi-Temp 1200	Sherwin-Williams
Thermaline 4001(4 to 5 mils)	Thermaline 4001(3.5 mils)	Carboline
Interzinc 22 (2 to 3 mils)	Intertherm 50(1 to 1.5 mils)	International Paint

2.6.11 *System FM-8A. (10-mil min., 2-coat system for high temperature surfaces)*

- **Use:** Unprimed ferrous metal surfaces covered with thermal insulation, having a maximum temperature range from 450° F to 1200° F. Ambient steel application – insulated carbon steel.
- **Surface Prep:** Type A1
- **Description:** Primer and finish coats shall be a one component, high solid, heat-resistant paint with DFT of 5-6 mils each coat. Minimum total DFT shall be 10 mils. The following products, or approved equivalents, shall be used.

Primer Coat	Finish Coat	Manufacturer
Hi-Temp 1027 CUI	Hi-Temp 1027 CUI	PPG
Heat Flex Hi-Temp 1200	Heat Flex Hi-Temp 1200	Sherwin-Williams
Thermaline 4001	Thermaline 4001	Carboline

2.6.12 *System FM-9. (4-mil min., 2-coat system for KILN)*

- **Use**: Unprimed ferrous metal surfaces having a maximum temperature range to 500° F.
- **Surface Prep**: Type A1
- **Description**: Primer and finish coats shall be a heat-resistant paint with DFT of 2-2½ mils each coat, unless noted otherwise. Minimum total DFT shall be 4 mils. The following product shall be used, no substitutes.

Primer Coat	Finish Coat	Manufacturer
Thurmalox 260 Series	Thurmalox 260 Series	Dampney Protective Coatings

Primer Coat	Finish Coat	Manufacturer
Heat Flex Hi-Temp 1200	Heat Flex Hi-Temp 1200	Sherwin Williams
Thermaline 2977 VOC	Thermaline 4900	Carboline
Hi-Temp 1027 (5 mil)	Hi-Temp 500VHA	PPG

2.6.13 *System FM-10. (6-mil 3-coat system)*

- **Use**: Shop primed ferrous metal surfaces inside air conditioned rooms or rooms having filtered air systems.
- **Surface Prep**: Type C
- **Touch-Up**: Type 1
- **Description**: When the shop applied primer is incompatible with the succeeding coats, apply 2 to 3 mils DFT of a universal alkyd primer coat. When the shop applied primer is compatible with the succeeding coats, no primer coat is required. Intermediate and finish coats are to be gloss alkyd paints with DFT of 2 to 3 mils each coat. Minimum total DFT shall be 6-mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	**Intermediate**	**Finish Coat**	**Manufacturer**
Interprime 298HS	Interlac 665	Interlac 665	International Paint
Carbocoat 150 Universal Primer	Carbocoat 45	Carbocoat 45	Carboline
Multi-Prime 94-258	7-LINE Series	7-LINE Series	PPG

2.6.14 *System FM-11A. (16-mil, 2-coat system) Buried Pipe with Coal Tar Epoxy*

- **Use**: Buried Pipelines with Coal Tar Epoxy coating. Note: Devtar 5A does not have coal tar, but is considered a coal tar epoxy equivalent.
- **Surface Prep**: Type A1
- **Touch-Up**: Type 1
- **Description** Apply primer and finish coat at a DFT of 8 mils each coat. Minimum total DFT shall be 16 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Devtar 5A	Devtar 5A	International Paint
Bitumastic 300 M	Bitumastic 300 M	Carboline

Primer Coat	Finish Coat	Manufacturer
Amercoat 78 HB	Amercoat 78 HB	PPG

2.6.15 *System FM-11B (50 mil, 2-coat system) Buried Pipe with Advanced Epoxy Coating*

- **Use**: Buried Pipelines
- **Surface Prep**: Type A1. Use Type A2 for Enviroline 376 F-30 with high heat or aggressive chemical service.
- **Touch-Up**: Type 1
- **Description**: Apply primer and finish coat at a DFT of 20 to 30 mils each coat. Minimum total DFT shall be 50 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer Coat	Finish Coat	Manufacturer
Interzone 485 or Enviroline 124 or Enviroline 376 F-30	Interzone 485 or Enviroline 124 or Enviroline 376 F-30	International Paint
Polyclad 975	Polyclad 975	Carboline

2.6.16 *System GM-1 (8-mil min., 2-coat system)*

- **Use**: Galvanized metal surfaces (where scheduled to be painted).
- **Surface Prep**: Type D
- **Touch-Up**: Type 2
- **Description**: Primer shall be catalyzed polyamide-cured organic zinc epoxy paint with DFT of 2 ½ to 3 ½ mils. The finish coat shall be high build, catalyzed, polyamide-cured epoxy paint with DFT of 5 to 6 mils. Minimum total DFT shall be 8 mils. One of the combinations of products or an approved equivalent shall be used.

Primer Coat	Finish Coat	Manufacturer
Amercoat 68HS	Amercoat 450H	PPG
Zinc Clad IV B69 A8/B69 V8	Hi-Solids Polyurethane B65-300 Series	The Sherwin-Williams Co.
Carbozinc 859	Carbothane 134HG	Carboline

2.6.17 *System GM-2 (Touch up of exposed galvanized metal surfaces).*

- **Use**: Damaged galvanized metal surfaces not receiving coating system.
- **Touch-Up**: Type 3

2.6.18 *System CMC-1 (2-coat system)*

- **Use**: Interior concrete masonry surfaces in battery rooms and HVAC rooms and other non-air conditioned rooms scheduled to be painted.
- **Surface Prep**: Type E
- **Description**: Prime coat shall be an epoxy ester filler paint with maximum coverage of 70 SF/gal. Finish coat shall be catalyzed, polyamide-cured, organic, semi-gloss epoxy paint with a maximum coverage of 168 SF/gal. One to the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Epoxy Ester Filler B61 W2	Heavy Duty Epoxy Low Sheen B67 Series	The Sherwin-Williams Co.
Sanitile 600	Sanitile 655	Carboline
95-217	Amerlock 2/400	PPG

2.6.19 *System CMC-2. (3-coat system)*

- **Use**: Interior concrete, concrete unit masonry surfaces inside air conditioned rooms and rooms with filtered air systems, and as scheduled to be painted.
- **Surface Prep**: Type E
- **Description**: Primer coat shall be acrylic filler paint with maximum coverage of 90 SF/gal. Intermediate and finish coats shall be gloss alkyd paint with maximum coverage per coat of 450 SF/gal. One of the following combinations of products, of an approved equivalent, shall be used.

Primer	Intermediate	Finish Coat	Manufacturer
Heavy Duty Block Filler B42 W46	Industrial Enamel B54Z-400 Series	Industrial Enamel B54Z-400 Series	The Sherwin-Williams Co.
Sanitile 100	Sanitile 155	Sanitile 155	Carboline
Block Filler 16-90	7-LINE Series	7-LINE Serires	PPG

2.6.20 System CMC-3. (3-coat system)

- **Use**: Exterior concrete and concrete masonry surfaces.
- **Surface Prep**: Type E

- **Description**: Primer coat shall be epoxy ester filler paint with maximum coverage of 70 SF/gal. Intermediate and finish coats shall be elastomeric acrylic paint with maximum coverage per coat of 53 SF/gal. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Intermediate	Finish Coat	Manufacturer
Intercryl 520	Intercryl 530	Intercryl 530	International Paint
Epo-Plex, Epoxy Block Filler B70W300/8 70V301	Sherlastic Elastomeric Coating A5 100 Series	Sherlastic Elastomeric Coating A5 100 Series	The Sherwin-Williams Co.
Sanitile 120	Flexxide Elastomer	Flexxide Elastomer	Carboline
90-712	Perma-Crete 4-110	Perma-Crete 4-110	PPG

2.6.21 System C-1 (4-coat system)

- **Use**: Hardener and dust proofer for exposed concrete floors where scheduled to be sealed.
- **Surface Prep**: As recommended by the paint Manufacturer: New concrete must be thoroughly dry and cured for a minimum of 10 days; for best results cure for a full 28 days. After concrete or concrete masonry work is patched, pointed up, and completely cured, clean the surface to remove loosely adhering concrete, dust, laitance, oil, wax, sealers, curing compounds, form release agents, and other contaminants in accordance with coating Manufacturer's recommendations and SSPC-SP13/NACE No. 6. Follow standard practice ASTM D4258 for cleaning concrete, ASTM D4259 for abrading concrete, and test method ASTM F1869 for measuring moisture vapor emission rate of concrete.
- **Description**: Four coats of BASF Master Builders – "MasterKure HD 300WB" or reviewed equivalent (coverage as recommended by Manufacturer). The number of applications and dilution ratios are dependent on the porosity and density of the concrete. Distribute evenly and mop up excess solution and puddles. Complies with State of California Air Resources Board approved Architectural coatings volatile organic compound (VOC) rule. Apply to new concrete floor(s) only after floor(s) has cured for a minimum of 28 days.

2.6.22 System C-2 (2-coat system, with non-slip surface)

- **Use**: Exposed concrete floors in Electrical Rooms, HVAC Rooms, and other rooms scheduled to be painted as noted on the drawings.
- **Surface Prep**: Type E
- **Description**: Primer coat shall be semi-gloss epoxy paint thinned with one quart of thinner per gallon of paint (minimum DFT 2 to 3 mils). Finish coat to be semi-gloss epoxy. Mix two to four ounces of clean washed sand per gallon of paint prior to applying paint roll on finish coat (minimum DFT 4 to 5 mils).

One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Intergard 345	Intergard 345	International Paint
Heavy Duty Epoxy Low Sheen B67 Series	Heavy Duty Epoxy Low Sheen B67 Series	The Sherwin-Williams Co.
Carboguard 890	Carboguard 890	Carboline
Amerlock 2/400	Amerlock 2/400	PPG

2.6.23 System C-3 (2-coat system)

- **Use**: Exposed concrete floors in Battery Rooms.
- **Surface Prep**: Type E
- **Description**: Primer coat shall be semi-gloss epoxy paint thinned with one quart of thinner per gallon of paint (minimum DFT 2 to 3 mils). Finish coat shall be high solid, catalyzed, polyamide-cure, gloss epoxy paint with DFT of 6 to 7 mils. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Intergard 345	Intergard 345 (semi-gloss)	International Paint
Heavy Duty Epoxy Low Sheen B67 Series	Ser-Tile B67 B67 WW200 Series	The Sherwin-Williams Co.
Carboguard 890	Carboguard 890	Carboline
Amerlock 2/400	Amerlock 2/400	PPG

2.6.24 System GB-1. (3-coat system)

- **Use**: Exposed gypsum board surfaces.
- **Surface Prep**: Type G
- **Description**: Primer shall be drywall sealer paint with a maximum coverage of 450 SF/gal. Intermediate and finish coats to be semi-gloss latex enamel with maximum coverage per coat of 450 SF/gal. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Intermediate	Finish Coat	Manufacturer
Intercryl 520	Intercryl 530	Intercryl 530	International Paint

Primer	Intermediate	Finish Coat	Manufacturer
Prep Rite 200 Wall Primer B28 W200	Promar 400 Latex Semi-Gloss B31 W400	Promar 400 Latex Semi-Gloss B31 W400	The Sherwin-Williams Co.
Sanitile 120	Sanitile 155	Sanitile 155	Carboline
Speedhide 6-2	Speedhide SG 12-510	Speedhide SG 12-510	PPG

2.6.25 System W-1. (2-coat system, in areas not exposed to sunlight)

- **Use**: Exposed interior wood surfaces exposed to manufacturing environments, painted solid colors.
- **Surface Prep**: Type F
- **Description**: Primer coat shall be high build, catalyzed, polyamide-cured, semi-gloss epoxy paint with a maximum coverage of 168 SF/gal. Finish coat shall be high build, catalyzed, polyamide-cured, semi-gloss epoxy paint with a maximum coverage of 168 SF/ gal. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Intergard 345	Intergard 345	International Paint
Heavy Duty Epoxy B67 Series	Heavy Duty Epoxy B67 Series	The Sherwin-Williams Co.
Carboguard 60	Carboguard 60	Carboline
Amerlock 2/400	Amerlock 2/400	PPG

2.6.26 System W-2. (2-coat system, in areas exposed to sunlight)

- **Use**: Exposed exterior wood surfaces to be painted solid colors.
- **Surface Prep**: Type F
- **Description**: Primer coat shall be high build, catalyzed, polyamide-cured, semi-gloss epoxy paint with a maximum coverage of 168 SF/gal. Finish coat shall be gloss urethane paint with a maximum coverage of 276 SF/ gal. One of the following combinations of products, or an approved equivalent, shall be used.

Primer	Finish Coat	Manufacturer
Intergard 345	Interthane 990 HS	International Paint

Primer	Finish Coat	Manufacturer
Heavy Duty Epoxy B67 Series	Hi-Solid Polyurethane B65-300 Series	The Sherwin-Williams Co.
Carboguard 60	Carbothane 134 HG	Carboline
Amerlock 2/400	Amercoat 450H	PPG

2.6.27 System W-3. (3-coat system)

- **Use**: Exposed wood surfaces in air conditioned rooms and rooms with filtered air systems, painted solid colors.
- **Surface Prep**: Type F
- **Description**: Primer coat shall be alkyd enamel paint with a maximum coverage of 380 SF/gal. Intermediate and finish coats shall be gloss alkyd paint with maximum coverage per coat of 450 SF/gal. One of the following combination of products, or an approved equivalent, shall be used.

Primer	Intermediate	Finish Coat	Manufacturer
Interlac 665	Interlac 665	Interlac 665	International Paint
Wood Primer B49 WZ2	Industrial Enamel HS B54Z-400 Series	Industrial Enamel HS B54Z-400 Series	Sherwin-Williams
Sanitile 120	Carbocoat 45	Carbocoat 45	Carboline
17-921	7-LINE Series	7-LINE Series	PPG

2.7. PREPARATION OF SURFACES

Surface preparation shall comply with the recommendations of the paint Manufacturer and the following requirements. Surface preparation shall be programmed so that contaminants from the preparation process will not fall on wet and newly painted surfaces.

2.7.1. *Type A (for unprimed ferrous metal surfaces).* Prepare surfaces as specified in Structural Steel Painting Council Specification (SSPC) SP-6/NACE No. 3, *Commercial Blast Cleaning*.

2.7.2. *Type A1 (for ferrous metal surfaces with chemical exposure, high heat, and/or immersion service).* Prepare surfaces as specified in SSPC Specification SP-10/NACE No. 2, *Near White Blast Cleaning.*

2.7.3. *Type A2 (for ferrous metal surfaces with immersion service, chemical exposure, and/or high heat areas).* Prepare surfaces as specified in SSPC Specification SP-5/NACE No. 1, *White Metal Blast Cleaning.*

2.7.4. *Type B (for unprimed ferrous metal surfaces).* Prepare surfaces as specified in Structural Steel Painting Council Specification SP-3, *Power Tool Cleaning*.

2.7.5. *Type C (for shop primed or shop finish painted ferrous metal surfaces).* Clean damaged areas to bare metal, SSPC SP-11, *Power Tool Cleaning to Bare Metal*. Clean all moisture and other contaminants from surfaces requiring additional paint coats.

2.7.6. *Type D (for galvanized surfaces indicated to be painted).* Solvent clean per SSPC SP1 to remove galvanizing post treatment. Clean damaged areas to bright galvanized film or to bare metal per SSPC SP11. Surface profile shall be 1.0 minimum. Clean all moisture and other contaminants from the surfaces.

2.7.7. *Type E (for concrete or concrete unit masonry surfaces).* After concrete or concrete masonry work is patched, pointed up, and completely cured, clean the surface to remove loosely adhering concrete, dust, laitance, oil, wax, sealers, curing compounds, form release agents, and other contaminants in accordance with coating Manufacturer's recommendations, SSPC-SP13/NACE No. 6, and ICRI 310.2R CSP 1-3. Follow standard practice ASTM D4258 for cleaning concrete, ASTM D4259 for abrading concrete, and test method ASTM F1869 for measuring moisture vapor emission rate of concrete. When recommended by the Manufacturer of the paint to be applied, the horizontal surfaces may be acid etched, neutralized, and rinsed clean per standard practice ASTM D4260 with pH tested per ASTM D4262, and moisture tested per ASTM D4263.

2.7.8. *Type F (for wood surfaces).* Remove dirt, oil, and other foreign matter with mineral spirits, sandpaper, or scrapers. Knots shall be scraped, thoroughly cleaned, and thinly coated with knot sealer. Pitch shall be scraped off or, if still soft, removed with mineral spirits and the resinous area thinly coated with knot sealer. Unless otherwise approved, painting shall proceed only when the moisture content of the wood does not exceed 12% as measured by a moisture meter.

2.7.9. *Type G (for gypsum board surfaces).* Remove dirt, dust, loose cement grit, and surface irregularities. Sand gypsum board joints and patches smooth.

2.8. TOUCH-UP PAINTING

2.8.1. *Type 1.* Damaged shop primed or shop finish painted surfaces shall be touched-up with the same paint materials, same number of coats, and same resulting dry film paint thickness as the original shop paint application. Touch-up painting shall be carefully feathered into the adjacent undamaged paint surfaces.

2.8.2. *Type 2.* Damaged galvanized surfaces to be coated shall be cleaned to bright galvanized film or to bare metal and touched-up with a 2.5 mil dry film thickness application of zinc rich epoxy paint.

2.8.3. *Type 3*. Damaged galvanized surface not receiving coating system shall be cleaned to bight galvanized film or bare metal touched up with ZRC Cold Galvanizing Compound in accordance with Manufacturer's printed recommendations.

2.9. OWNER MAINTENANCE MATERIALS

At completion of project, Contractor shall provide, in original, unopened containers bearing Manufacturer's labels, maintenance materials equal to 5% of the total quantity of each material, color, and sheen used in the Work, or a five-gallon container of each material, color, and sheen used in Work, whichever quantity is greater. Materials shall be delivered to location of Owner's choosing and transferred to Owner in new, properly-handled condition.

3.0 EXECUTION

3.1 HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner which will prevent damage. Materials shall be stored in a fire-safe, weather-tight and dry place limited to the temperature recommended by the paint Manufacturer.

3.2 SCHEDULING AND COORDINATING

Scheduling and coordinating of work specified in this section with that specified in other sections shall be the responsibility of the Contractor. Surfaces scheduled to be painted and which will be made inaccessible by installation of themselves or other items shall be completely painted before installation.

3.3 ACCEPTANCE OF OTHER WORK

Before starting any work, surfaces to receive paint shall be examined carefully for defects which cannot be corrected by the procedures specified under PREPARATION OF SURFACES, and which might prevent satisfactory painting results. The Contractor shall inform the Owner's Representative of any conditions which would prevent the proper application of the paint work so that these items may be corrected. Beginning the application of paint materials shall indicate the Contractor's acceptance of the surface to be painted as being acceptable for the proper application of the paint.

3.4 WORKMANSHIP

The finished surfaces shall be free from runs, drops, ridges, waves, laps, brush marks, and variations in color, texture, and finish. The hiding shall be complete, and each coat shall be applied to produce an integral film of uniform thickness. Special attention shall be given to insure that edges, corners, crevices, welds and connectors receive a film thickness equivalent to that of adjacent painted surfaces. Other surfaces shall be protected from paint over-spray, splashes, drips and contamination by the use of tents, drop cloths or other effective measures. Items not to be painted, but in contact with items to be painted, shall be removed if possible, or otherwise protected prior to surface preparation and/or painting operations. Such removal and reinstallation shall be done by workers skilled in the trades involved. Undercoats shall be tinted an identifiably different shade from succeeding coats.

Unless directed otherwise, when a door or frame is indicated to be painted, all exposed faces and edges of the door or frame are to be painted.

3.5 MIXING AND THINNING

At time of application, paint shall show no signs of hard settling, excessive skinning, livering, or other deterioration. Paint shall be thoroughly stirred, strained, and kept at a uniform consistency during application. Paint of different Manufacturers shall not be used or mixed together. Where necessary to suit conditions of surface, temperature, weather and methods of application, paint may be thinned immediately prior to application in accordance with the Manufacturer's printed instructions. The use of thinner for any reason shall not relieve the Contractor from obtaining complete hiding or the specified film thickness. Where DFT does not meet minimum requirements, provide additional coats at no additional cost to the Owner.

3.6 SURFACE, TEMPERATURE, VENTILATION, AND ILLUMINATION CONTROL

Paints shall be applied only to clean and dust-free surfaces that are completely free from surface moisture, frost, or ice. Temperature of surfaces and areas shall be maintained, as recommended by the Manufacturer of the paint being applied, during painting and curing. During periods of inclement weather, painting may be continued by enclosing the surfaces with temporary shelter and applying artificial heat, provided the temperature and humidity requirements are maintained. Salamanders, open fires, or other unsafe heating methods shall not be permitted. Adequate and safe ventilation and sufficient illumination for visual inspection of applied paint coatings shall be provided during all painting and curing operations.

3.7 SAFETY AND HEALTH

3.7.1. General

3.7.1.1. Safety requirements include:

- Those stated in this Technical Specification.
- Applicable federal, state, and local rules and requirements.
- Instructions and GHS SDS sheets of coating supplier. Must be on site prior to, or concurrent with, bringing the paint materials to the jobsite.
- All material must be approved by Owner prior to material being brought on site.
- Observe proper safety precautions to protect against flammability and potential toxicity of coatings.
- Dispose of coatings, solvents, thinners, etc., at appropriate offsite hazardous waste facilities. Do not use plant or yard drains for such disposal.
- Safe handling practices are required and include SSPC PA Guide 3.
- Coating materials are considered a health hazard if it can directly or indirectly cause injury or incapacitation, either temporary or permanent, from exposure by contact, inhalation, or ingestion. If using products containing any hazardous compounds, provide coating applicators with appropriate personal respiratory and dermal protection.

3.7.2. Open Air Respiratory Protection

For spraying coatings in open air, applicators must wear National Institute for Occupational Safety and Health (NIOSH) approved, full-face paint spray respirator to prevent eye contact with glycol ethers.

Respirator cartridges must have fabric pre-filter followed by activated charcoal bed to prevent inhalation of vapors or mist.

3.7.3. Confined Space Respiratory Protection

For spraying coatings in confined spaces, applicators must wear NIOSH approved, full-face positive pressure, air supplied respirators.

If vapor concentrations in confined spaces can reach levels immediately dangerous to life or health, applicators must have 5 minute escape bottle as an alternative air supply should primary air supply be interrupted.

3.7.4. Dermal Protection

Applicators must wear neoprene gloves and clothing as protection against skin absorption of glycol ethers. Because neoprene protection is diminished if material is abraded, cut, or otherwise deteriorated, protective clothing must be:

- Inspected frequently to ensure that integrity of materials is preserved.
- Rinsed off after each work shift to remove residual glycol ethers and prolong garment life.
- Discard and replace gloves or clothing that has become saturated or has remained in prolonged contact with liquid containing glycol ethers.

3.8 ELECTROLYTIC PROTECTION

Surfaces of dissimilar unpainted metals to be in contact, or of non-ferrous metal to be in contact with concrete, mortar, wet or pressure treated wood, or absorptive materials subjected to wetting shall be painted with a protective coating as recommended by the paint Manufacturer before installation.

3.9 CONTAMINATED SURFACES

If surrounding conditions cause moisture or other airborne contaminants to be deposited on surfaces to be painted, painting operations shall be suspended, and effective temporary shielding devices shall be installed to prevent moisture and other airborne contaminants from entering the area in which painting operations are being performed. Remaining unpainted surfaces shall be re-cleaned as recommended by the paint Manufacturer before commencing painting operations when conditions again permit.

3.10 COATING PROGRESS

Sufficient time shall elapse between successive coats, and after, to permit proper drying and curing per Manufacturer's instructions.

3.11 TIME BETWEEN SURFACE PREPARATION AND PAINTING

Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a prime coat as soon as practicable after the surface preparation has been completed, but in any event prior to deterioration or contamination of the prepared surfaces.

3.12 INCOMPATIBLE PAINT MATERIALS

Painted surfaces, which require over-coating with one or more additional paint coats and which are not compatible with the specified over-coating material, shall have one coat of universal barrier coat at minimum 2 mils DFT applied before the incompatible over-coating material is applied. A small masked-off test area shall first be made to determine compatibility of the universal barrier coat with the surface to be over-coated.

3.13 SAFETY COLOR CODING

Machine personnel protector guards, personnel safety barriers, equipment and/or devices, and other surfaces requiring safety color code marking, shall be painted finish colors complying with American National Standards Institute Specification ANSI Z53.1, *Safety Color Code for Marking Physical Hazards*.

3.14 PIPING IDENTIFICATION MARKING

3.14.1 Piping shall receive colored identification markings complying with American National Standards Institute Specification ANSI-A13.1 *Scheme for Identification of Piping Systems*. Alternate colors may be selected by the Owner's Representative, if required to comply with the marking system used by the Owner.

3.14.2. Pipe marking system shall consist of painted colored bands with stenciled identification markings on the bands. Pipe shall be marked at 50 foot maximum intervals on straight runs, within 10 feet on each side of changes in direction, and immediately on each side of penetrations through walls, floors, or ceilings. Bands shall be of sufficient length to receive the identification markings. Insulated pipes shall have the markings applied to the insulation. Closer marking intervals may be selected by the Owner's Representative to comply with the Owner's marking system.

3.14.3. Stenciled markings shall consist of the service identification (i.e. "steam", "air", etc.) and directional arrows, and shall be black on light colored bands and white on dark colored bands. Lettering shall be 3½ inch high for pipes greater than 10 inch diameter, 2½ inch high for pipes 8 inch to 10 inch diameter,1¼ inch high for pipes 2½ inch to 6 inch diameter, ¾ inch for pipes 1½ inch to 2 inch diameter, and ½ inch for pipes less than 1¼ inch diameter. Steam and hot liquid lines shall receive an additional marking showing the line pressure. Other lettering sizes may be selected by the Owner's Representative to comply with the Owner's marking system.

3.14.4. All markings to be placed on pipes shall be reviewed and approved by the Owner's Representative before purchase of marking materials.

3.15 CLEAN UP

Cleaning materials shall be used, stored, and disposed of in a fire-safe manner. Stains, defacement, or other damage caused by painting operations shall be cleaned, repaired, or corrected. Staging, scaffolding, and surplus material shall be removed from the site at the completion of the job and the entire job left clean and acceptable to the Owner's Representative.

3.16 PROTECTION

Protection of installed painting shall be the responsibility of the Contractor until the project has been accepted by the Owner. Paint shall be protected from damage during construction. Damaged or improperly installed paint shall be removed and replaced with new paint by the Contractor at no additional cost to the Owner.

3.17 SCHEDULE OF COLOR

Item or Equipment	**Color Name**
SAFETY -	
Handrails	- Galvanized + Yellow
Ladders & Cages	- Galvanized + Yellow
Aisle Stripes	- Yellow

Item or Equipment	Color Name
Crane/Drop Areas	- Black/Yellow Stripes
Equipment Guards	- Orange
Barricades	- Reflective Yellow/Black Stripes
Safety Showers	- Green/White Stripe
Inside Electrical Panel Doors	- Mfg. Standard or as specified in the Electrical Specification
Breathing Air Stations Shall Have a 12" x 24" back board painted GREEN with the following lettering: BREATHING AIR FOR RESPIRATORY PROTECTION ONLY	- Green/White Stripe
ELECTRICAL -	
Motor Control Centers	- Mfg. Standard or as specified in the Electrical Specification
Control Panels	- Mfg. Standard or as specified in the Electrical Specification
Motors	- Mfg. Standard or as specified in the Electrical Specification
Transformers and Substation Enclosures	- Mfg. Standard or as specified in the Electrical Specification
EQUIPMENT -	
Hazardous Equipment	- Mfg. Standard or as specified in the Electrical Specification
Non-Hazardous Equipment	- Mfg. Standard or as specified in the Electrical Specification
Storage Tanks	
STRUCTURAL STEEL -	
Power Island	- Galvanized
Pipe Racks	- Galvanized
Stair Treads/Grating	- Galvanized
Masonry Buildings	- N/A
PIPING -	
Air -	
Plant	

Item or Equipment	Color Name
Instrument	
Hazardous Materials -	
Chemicals, Gases	
Nitrogen	
Steam	
Water -	
Fire	
Drinking - Potable	- Green/with White Letters “Potable”
Other	- Green

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**METAL BUILDING SYSTEMS**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1512**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

REVISION STATUS

REV	ISSUED FOR	REVISED BY	CHECKED BY	APPROVAL	APPROVAL	DATE
A	APPROVAL	GJB	BEA	MGW	DH	18MAR21
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Permit Stamp

Architect's Seal

SECTION 133419

METAL BUILDING SYSTEMS

1.0 GENERAL

1.1 SCOPE

Work under this section includes all materials, labor, equipment and services for a complete installed Metal Building System described and detailed in these Specifications, on the Drawings, and in accordance with the Scope of Work Document. Scope of Work shall include designing, engineering, furnishing, installing, and erecting the metal building system frame, siding, roofing, liner panels, insulation, louvers, doors, windows, gutters, downspouts, flashing and trim, and framing for wall and/or roof mounted HVAC equipment and other miscellaneous openings.

Concrete slab on grade and foundation, including 4'-high concrete knee-walls at building perimeter, will be designed and constructed by others. Metal building system Contractor shall provide information required for foundation design, including reactions, anchor bolt diameter and material (embedment length by foundation designer), anchor bolt locations and projection above rough concrete with allowance for grout.

Where primary or lean-to Metal Building System frames are indicated to support a second floor or mezzanine per the Building Sections, the second floor framing and second floor slab are considered to be part of the overall Metal Building System. Second floor slabs will not be provided by others.

1.2 DESIGN CRITERIA

1.2.1 Metal Building System shall comply with the requirements of the 2018 Kentucky Building Code, the requirements of all National, State and Local Codes applicable at the place of construction, Factory Mutual Systems Loss Prevention Standards for wind and snow loading, including 1-90 windstorm exposure, and Underwriters' Laboratories design criteria and standards, as applicable.

1.2.2 Structural design shall include importance factors for Risk Category III per ASCE 7-10.

1.2.3 The roof and wall panel systems shall be designed, furnished and installed to comply with Factory Mutual (FMG) data sheets and the following design criteria from ASCE 7-10:

Roof Slope:	1:12, unless noted otherwise
Exposure Category:	C
Risk Category:	III
Wind Speed (Ultimate):	120 MPH
Topographic Factor:	Kzt = 1.0

1.2.4 FM Global (FMG) approved roofs shall have corner and perimeter enhancements with approved perimeter flashing. See FMG Property Loss Prevention Data Sheet 1-28, Wind Design, for criteria, and Roof Plan for general guidelines.

1.2.5 The Metal Building System shall be designed using the Seismic design parameters in accordance with 2018 Kentucky Building Code Section 1613.

1.2.6 Deflection of frame members shall not exceed L/240 vertical due to combined dead and live load.

1.2.7 Maximum allowable building drift at eaves shall be H/180. Seismic load combinations do not need to include over strength factors for checking allowable building drift.

1.2.8 Metal building system lateral force resisting system shall be Rigid Frames. Rigid frames shall be designed as pinned base. Rigid base may be used with prior approval from the Engineer. Rigid frames shall be located as shown on the Drawings.

1.2.9 Metal Building System components, fabrication and erection shall conform to the design criteria and standards of the Metal Building Manufacturer's Association *Metal Building Systems Manual*, current edition.

1.2.10 Structural steel shall be designed, fabricated and erected in accordance with the requirements of the American Institute of Steel Construction's *Specification for Structural Steel Buildings* and the design criteria of the MBMA *Metal Building Systems Manual*, current editions, as applicable.

1.2.11 All welding shall conform to the requirements of the American Welding Society's *Structural Welding Code - Steel*, current edition. All welders shall be qualified for the type of weld performed.

1.2.12 Light gauge cold-formed members shall be designed in accordance with the requirements of the American Iron and Steel Institute's *Cold-Formed Steel Design Manual.*

1.2.13 Gutters and downspouts shall be sized for the design rainfall rates at the project location using a 100-year storm event. Downspout locations shall be shown on the Drawings and shall be coordinated with other project requirements to ensure adequate surface drainage away from the building.

1.3 MANUFACTURING CRITERIA

Metal buildings shall be the product of one Manufacturer who has been regularly engaged in the design of metal building structures and systems for a period of at least ten (10) years. All material shall be new, unused, and free from defect.

1.4 DESCRIPTION

1.4.1 The Metal Building Systems covered by this Specification are to be of the type and size shown on the Drawings. Roof slope, interior clear heights, approximate eave height and column spacing shall be as shown on the Drawings. Minimum roof slope, unless shown otherwise on the Drawings, shall be 1” inch per foot.

1.4.2 Diagonal bracing shall be located so as not to interfere with layout requirements for door and equipment openings as shown on the Drawings. Diagonal bracing shall be rod-type with turnbuckles in lieu of cable. Use not less than 5/8” diameter galvanized threaded rods in compliance with ASTM A36 or A572, Grade 50. Portal frame bracing may be used to eliminate interference with layout requirements for opening if necessary.

1.5 DESIGN LOADS

1.5.1 Design loads shall meet or exceed those required by the codes and standards referenced herein for the project location. Roof system shall comply with Factory Mutual uplift requirements for 1-90 exposure. Roof live load design shall be a minimum of 20 PSF with no reductions in load for the primary and secondary framing members. Design wind loads shall be determined for the wind speed with gust factor and exposure category required for the project’s location.

1.5.2 Dead Loads (D)

Dead loads shall include the weight of the structure, roof, floors, walls, weight of the finishes, platforms and any other material.

The dead loads that apply to the buildings and structures will be in accordance with their "actual" conditions. Dead loads that are produced by equipment will be in accordance with the equipment vendor’s drawings and specifications. Collateral loads for suspended utilities shall be as calculated for each structure, including pipes, cable trays, lights, etc.

1.5.3 Live Loads (L)

a) Normal operation live loads shall be as indicated by the Vendor or Project Process Engineer. If this information is not available, the following live loads may be used as a minimum:

- Industrial floors with light equipment (less than 1 kip per unit): 100 psf
- Industrial floors with heavy equipment: 150 psf
- Manufacturing areas and storage warehouses, light: 125 psf
- Manufacturing areas and storage warehouses, heavy: 250 psf
- Walkways and elevated platforms (other than exit ways): 60 psf
- Offices, private areas: 50 psf
- Aisles, corridors, exit ways, stairs and landings: 100 psf
- Roofs (L_r): 20 psf

b) Live loads produced by equipment will be in accordance with the equipment vendor's drawings and specifications.

1.5.4 Snow Load (S)

In accordance with 2018 Kentucky Building Code Section 1608.

- Ground snow load: 15 psf

1.5.5 Wind Load (W)

In accordance with 2018 Kentucky Building Code Section 1609.

- Ultimate design wind speed for Risk Category III structures: 120 mph
- Exposure category: C
- Topographic factor: K_{zt} = 1.0

1.5.6 Earthquake Loads (E)

In accordance with 2018 Kentucky Building Code Section 1613.

For Kentucky, the Seismic Design Category determined from the 2018 Kentucky Building Code along with ASCE 7-10 is Category D.

1.5.7 Thermal Effects

Design temperature range for exposed structures:

- Summer High: 93.3°F
- Winter Low: 0°F

Thermal expansion joints in buildings shall be located in accordance with the National Academy of Sciences Technical Report No. 65, Expansion Joints in Buildings.

Atmospheric ice loads shall be considered in accordance with 2018 Kentucky Building Code Section 1614.

1.5.8 Monorail Loads

Monorail design shall include impact factors, lateral thrust load and weight of hoist for the rated hoist capacity below the hoist hook. Monorail deflection under full load shall be liminted to L/450 with L = Maximum span between support points. Hoist may be assumed to weigh a minimum of 100 lbs (1/2 ton monorail) and 300 lbs (3 ton monorail). Refer to Design Drawing 143993-ASA-DD3-PLS-1513 for additional information.

1.5.9 Deflections

Maximum allowable deflection values for design are as follows:

- General beams due to dead plus live load: 1/300 of span
- Trusses due to dead plus live loads: 1/700 of span
- Purlins, roof sheets and wind columns due to dead plus live loads: 1/200 of span
- Siding and girts due to wind loads: 1/120 of span
- Lateral deflection due to wind loads 1/100 of height

1.5.10 *Auxiliary Loads*. In addition to the above design loads, the building frame shall be designed to support any special dead and live equipment loads plus overall collateral load of 30 psf throughout. Collateral loads for the roof represent a uniform suspended load imposed by piping, lighting fixtures, sprinkler system, and other miscellaneous equipment. The Metal Building System Manufacturer is responsible to coordinate any other specific loading requirements related to all disciplines, including the process equipment vendors' documents.

The collateral loads are to be considered as a dead load for seismic load combinations and as a non-reducible live load for wind load combinations and therefore not present for uplift considerations.

Purlins shall be designed for an additional 1500 lbs concentrated load applied at midspan, structural frames for an additional 2,000 lbs concentrated load applied at midspan, and columns for an additional 2,000 lbs concentrated load applied at the centroid of the cross section of the member, unless otherwise noted on the Drawings. These loads shall be considered a Live Load and are to be applied locally to determine the required size of the individual member. These loads are to account for Owner installed hanging loads and do not need to be included with the building frame analysis and foundation loads.

Purlins and girts or other additional members shall be designed and provided as required to support equipment loads suspended from roof or walls where shown on the Drawings.

1.6 STRUCTURAL ANALYSES

Within two calendar weeks after award of the Contract, foundation reactions shall be submitted by the Metal Building System Contractor to the Owner's Representative. The column reactions shall include; Dead Loads, Live Loads, Wind Loads, Snow Loads, and Seismic Loads.

1.7 SHOP DRAWINGS AND CALCULATIONS

Complete shop drawings of the Metal Building System shall be submitted to the Owner for approval within six weeks after award of the Contract. Shop drawings and calculations shall bear the seal of a Professional Engineer registered in the State of Kentucky.

2.0 PRODUCTS

2.1 STRUCTURAL STEEL

Primary structural steel shall conform to ASTM A992 Grade 50. Alternative grades of steel may be proposed by the metal building supplier, subject to approval by the Owner.

Secondary framing members, including all C and Z purlins and girts, shall be cold-formed from pre-galvanized steel sheet and sized to meet loading requirements as listed. All such members shall comply with ASTM Standard Specification A653.7.

2.2 HIGH STRENGTH BOLTS

High strength bolts, nuts and washers shall be mechanically or hot-dip galvanized and conform to ASTM Designation F3125 Grade A325, Type 1. Nuts shall conform to ASTM A563 Heavy Hex. Washers shall conform to ASTM F436. All high strength bolts used in connecting structural framing for wind and seismic resisting systems shall be twist-off-type tension control bolts or shall have direct tension indicator type washers. Where twist-off-type tension control bolts are used, ends of bolts shall be touch-up painted with zinc-rich galvanized repair paint after installation.

2.3 BASE PLATES

Base plates, anchor bolt size and number of anchor bolts for building frames and columns shall be designed by the Metal Building Systems Engineer of Record. Base plate shall have oversized holes for anchor bolts. Anchor bolt diameters shall be determined by the Metal Building Systems Engineer of Record using ASTM F1554, Grade 36 anchor bolts (embedment design and supply of anchor bolts will be by others). Bottom of base plates for building frames and columns shall be set a minimum of 1½" above the top of concrete to allow for shimming and grouting of the base plates.

2.4 COATING STRUCTURAL STEEL

Structural steel, including all primary building framing members, shall receive the building Manufacturer's standard surface preparation and primer paint system. Steel shall be cleaned of all mud, dirt or other debris prior to erection. Any required touch-up of damaged primer shall be cleaned to bare metal and field-applied for full efficacy to match shop-applied primer.

Secondary framing members, including all C and Z purlins and girts, shall be cold-formed from pre-galvanized steel sheet with no additional coating.

2.5 INSULATED METAL ROOF PANEL

Roof panel shall be MetlSpan's CFR Standing Seam, Foamed-Insulation-Core Metal Roof Panel, concealed fastener system. Color shall be as selected by the Owner.

2.6. Exterior Face Sheet: MetlSpan, CFR

Thickness	4 & 6" thick panels, 0.028 inch/24 gauge
Metal surface texture	Stucco Embossed

Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Profile	2” standing seam w/ Mesa profile
Panel width (approx.)	42”, standing seam 42” o.c.
Side joints	Overlapping type

2.7. Interior Face Sheet: MetlSpan, CFR

Thickness	0.028 inch/24 gauge
Metal surface texture	Stucco Embossed,
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Profile	Mesa
Panel width (approx.)	42”
Side joints	Overlapping type

2.8 METAL ROOF PANEL ACCESSORIES

2.8.1 Metal Roof Panel Accessories, General: Provide complete metal roof panel assembly incorporating trim, copings, fasciae, parapet caps, soffits, sills, snow guards, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap tapes, closure strips, and caps for a complete installation. Fabricate and install accessories in accordance with SMACNA Manual.

2.8.2 Formed Flashing and Trim: Match material, thickness, and color of metal roof panel face sheets.

2.8.3 Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on Drawings:

- Base trim.
- Coping.
- Panel installation perimeter.
- Opening perimeters.

2.8.4 Sealants: One or Two component polyurethane sealant compounds shall be as recommended by the metal roofing manufacturer for use in the project location. The locations and types of sealant joints shall be indicated on the shop drawings.

2.8.5 Panel Clips: Concealed stainless steel clip configured specifically for metal roof panel profile, engaging face and liner panel edge without compressing panel insulation.

2.8.6 Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal roof panels.

2.9 SNOW RETENTION SYSTEM

At roof perimeter over any doorway, roadway, or walkway below, provide heavy-duty, 2-row, snow retention fencing. System shall clip to roofing seams; no penetrations through roofing material are acceptable. Snow retention systems shall be included in the Metal Building Systems submittal.

2.10 FALL PROTECTION SYSTEM

Provide permanent fall arrest system at locations on roofs to meet OSHA requirements for Personal Fall Arrest System per 29 CFR 1926.502(d). Components of this system shall include anchorages capable of supporting weights per requirements found in the standard:

https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.140.

Follow all Manufacturer's instructions for installation under project conditions. Provide both peak anchors and stanchion clamps for full coverage over the roof planes. Fall protection system and anchorage locations shall be included in the Metal Building Systems submittal..

2.11 PURLINS

The cold-formed, galvanized purlin configuration and thickness shall be the building Manufacturer's standard, provided all design criteria, including deflection, is met or exceeded. The deflection of the purlins shall not exceed L/180 of its span when supporting the design loads specified herein.

In locations where columns or main frame bays have been omitted due to equipment conflicts, the building Manufacturer may, at his option, substitute steel joists or alternate industry-accepted secondary roof framing components. In this event, the type of alternate secondary roof framing is to be included with the bid.

2.12 ROOF OPENINGS

All round or square openings shall be framed with a metal base fabricated from galvanized steel. The base and its appurtenance shall be supported by the roof purlins and/or header framing (if required). The base shall have a minimum projection of 12 inches above the weather surface of the roof, and shall be properly flashed and sealed to the roof panels providing complete support and weather tightness. Metal gauges shall be adequate to safely support installed equipment and other applied loads. All curbs shall be factory fabricated in accordance with reviewed details. Roof openings will be located as shown on the Drawings. At all locations, differential movement between the roof and the penetrations shall be accounted for.

2.13 INSULATED METAL WALL PANELS

2.14 Non fire-resistance-rated wall panel siding shall consists of MetlSpan's LS-36: Lap Seam, Exposed Fastener, Foamed-Insulation-Core Metal Wall Panels: Structural metal panels consisting of exterior metal sheet with ribs and minor rib imprinting in the vertical direction, and interior metal sheet, with factory foamed-in-place polyurethane core in thermally-separated profile, with tongue-and-groove panel edges, attached to supports using exposed fasteners.

- Panel thickness shall be 4", with min R-26 thermal resistance.
- Panel thickness shall be 6", with min R- 26 thermal resistance.
- Color on all exposed surfaces shall be as selected by the Owner.

2.15 Fire-resistance-rated wall panel siding shall consist of MetlSpan's ThermalSafe Fire-Resistant-Thermal-Insulation-Core Metal Wall Panels: Structural metal panels consisting of exterior metal sheet with ultra-light Mesa wave pattern 1/32-inch and interior metal sheet with ultra-light Mesa wave pattern 1/32-inch deep, with structural mineral wool core factory-bonded during fabrication in thermally-separated profile, with tongue-and-groove panel edges designed to form weathertight seals, attached to supports using exposed fasteners.

- Color on all exposed surfaces shall be as selected by the Owner.

2.16 Exterior Face Sheet: MetlSpan LS-36

Thickness	4 & 6" thick panels, 0.028 inch/24 gauge
Metal surface texture	Ribbed and embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner
Panel width (approx.)	36", major rib spacing, 12" o.c.
Side joints	Overlapping type

2.17 Interior Face Sheet: MetlSpan LS-36

Thickness	0.028 inch/24 gauge
Metal surface texture	Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by the Owner

Panel width (approx.)	36”, embossed rib spacing, 4” o.c.
Side joints	Overlapping type

2.18 Exterior Face Sheet: MetlSpan, ThermalSafe

Thickness	4” thick (1-hour) panels, 0.028 inch/24 gauge
Metal surface texture	Mesa Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by Owner
Profile	1/32” deep wave pattern (Mesa) w/ exposed fasteners
Panel width (approx.)	36”
Side joints	Flush double tongue and groove

2.19 Interior Face Sheet: MetlSpan, ThermalSafe

Thickness	0.028 inch/24 gauge
Metal surface texture	Mesa Embossed
Coating System	Fluoropolymer two-coat system
Paint color	As selected by Owner
Profile	1/32” deep wave pattern (Mesa) w/ exposed fasteners
Panel width (approx.)	36”
Side joints	Flush double tongue and groove

2.20 METAL WALL PANEL ACCESSORIES

Metal Wall Panel Accessories, General: Provide complete metal wall panel assembly incorporating trim, copings, fascia, parapet caps, soffits, sills, inside and outside corners, and miscellaneous flashings. Provide manufacturer's factory-formed clips, shims, flashings, gaskets, lap tapes, closure strips, and caps for a complete installation. Fabricate and install accessories in accordance with manufacturer’s written instructions.

Formed Flashing and Trim: Match material, thickness, and color of metal wall panel face sheets.

Extrusion Trim: Provide manufacturer-provided extruded trim for the following locations and as indicated on the Drawings:

- Base trim.
- Coping.
- Panel installation perimeter.
- Opening perimeters.

Sealants: One or two component polyurethane sealant compounds shall be as recommended by the metal panel system manufacturer for use in the project location. The locations and types of sealant joints shall be indicated on the shop drawings.

Panel Clips: Concealed stainless steel clip configured specifically for metal wall panel profile, engaging face and liner panel edge without compressing panel insulation.

Fasteners: Self-tapping screws, bolts, nuts, and other acceptable fasteners recommended by panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal wall panels.

2.21 BLAST RELIEF PANELS

Blast relief panels, where shown on the Drawings, shall be building manufacturer's design and product. Panels shall release outward from building structure in the event of interior blast event. Clips or fasteners shall be designed by the building Manufacturer to allow panels to be released at the interior static design pressure of 30 psf. Panels shall be securely tethered to the building structure for safety. All panels shall be reattachable. Panels shall be shop coated with the Manufacturer's standard oven cured polyvinylidene fluoride coating.

Panels shall be flashed into the siding system without impeding their intended purpose and performance.

2.22 LINER PANEL

Liner panels, where shown on the Drawings, shall be building Manufacturer's standard and shall be minimum 24 gauge galvanized steel. Panel shall be shop coated with the Manufacturer's standard oven cured polyvinylidene fluoride coating.

Panel height shall be approximately 8'-0", unless otherwise shown on the Drawings.

2.23 GIRTS

Girt configuration and thickness shall be the building Manufacturer's standard provided all design criteria, including deflection, are met. Based on a simple span, girt deflection shall not exceed L/180 of its span when supporting the design loads specified herein.

2.24 INTERIOR STEEL STAIRS

Stairs indicated in the Drawings shall be the building Manufacturer's standard steel, closed riser, concrete-filled steel pan stair. All stairs shall meet the 2018 Kentucky Building Code requirements for stair dimensions and components, handrails, and guardrails, where applicable. Steel stair shall be delivered and installed shop-primed; the stair will be field-painted per Specification 143993-ASA-DD3-SPC-1510, PAINTING AND

COATING. Concrete in the steel stair pans and at landings is by the building Manufacturer.

2.25 EXTERIOR STEEL STAIRS

Stairs indicated in the Drawings shall be the building Manufacturer's standard steel, open riser, steel-grating tread stair with serrated walk surface. All stairs shall meet the 2018 Kentucky Building Code requirements for stair dimensions and components, handrails, and guardrails, where applicable. Steel stair shall be delivered and installed shop-primed; the stair will be field-painted per Specification 143993-ASA-DD3-SPC-1510, PAINTING AND COATING.

2.26 METAL PERSONNEL DOORS & FRAMES

Personnel doors shall comply with Specification 143993-ASA-DD3-SPC-1509, HOLLOW METAL DOORS & FRAMES.

2.27 DOOR HARDWARE

Door hardware shall comply with Specification 143993-ASA-DD3-SPC-1507, DOOR HARDWARE.

2.28 OVERHEAD COILING DOORS

Overhead coiling doors shall comply with Specification 143993-ASA-DD3-SPC-1506, OVERHEAD COILING DOORS.

2.29 GUTTERS AND DOWNSPOUTS

Gutters and downspouts shall be prefinished, min 22 gauge galvanized steel or alumimum, color as selected by the Owner. Fastener heads, trim and flashings shall match wall panel finish. Refer to the Exterior Elevations for specific locations of gutters and downspouts. Metal Building Vendor shall design gutter system to evacuate rainfall from roof planes per climatic, geographic region per 100-year storm data.

All gutters and downspouts (to 12" below grade) shall be provided with heat trace cabling for ice and snow melt applications. Provide complete system meeting requirements of Specification 143993-ASA-DD3-SPC-1511, ELECTRIC HEAT TRACING SYSTEM FOR GUTTERS.

2.30 FASCIAS AND FLASHINGS

Fascias and flashings shall be installed in the locations shown on the Drawings and where required to make the building water-tight. Flashings shall be galvanized steel sheet, conforming to the finish of the building siding or roofing to which the flashing is attached. Roof perimeter fascia/flashing shall be FMG approved.

Fascias and flashings shall match wall panel finish. Refer to the Exterior Elevations for specific locations of fascias and flashings.

3.0 EXECUTION

3.1 BUILDING FRAME ERECTION

Erection shall be performed in accordance with the latest *Code of Standard Practice for Steel Buildings and Bridges* as published by the American Institute of Steel

Construction; the design criteria of the MBMA *Metal Building Systems Manual*, current edition, as applicable; and the codes and standards referenced herein.

Steel shall be erected plumb and true to line. Adequate temporary bracing shall be provided to sustain loads on the structure during erection. Care shall be exercised not to overload members by storing or hanging materials, equipment, piping, etc. that is not included in the design.

3.2 ROOFING, SIDING AND DECKING

Roofing, siding and decking shall be erected in accordance with the Manufacturer's Specifications, the Specifications referenced herein, and reviewed erection layouts. No equipment or material shall be directly hung from the roof panels, wall panels or wall liners.

3.3 MISCELLANEOUS ITEMS

All doors, louvers, and miscellaneous items shall be installed in accordance with the Manufacturer's printed Specifications and the reviewed Shop Drawings.

3.4 CLEANUP AND PROTECTION

At the completion of the work, the Contractor shall remove all surplus materials, waste and debris from the site. Damaged materials shall be removed and new materials installed at no cost to the Owner.

END OF SECTION

CONSTRUCTION SPECIFICATION

TITLE:	**CONCRETE UNIT MASONRY**	PROJECT DOC. NO.:	**143993-ASA-DD3-SPC-1513**	REV.	**0**

PROJECT NAME:	D.B. Wilson FGD Replacement	PROJECT NO.:	245891
CLIENT:	Big Rivers Electric Corporation	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	GJB	**DATE**	25FEB21	**CHECKED BY:**	BEA	**DATE**	10MAR21
APPROVED BY:	MGW	**DATE**	10MAR21	**APPROVED BY:**	DH	**DATE**	28MAY21

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Permit Stamp

Architect's Seal

SECTION 042200

CONCRETE UNIT MASONRY

1.0 GENERAL

The purpose of this Specification is to ensure compliance with The Masonry Society TMS 402/602-16 “Building Code Requirements and Specification for Masonry Structures”. It is the intent of this Specification to conform to the requirements of TMS 402/602-16 as a minimum standard.

1.1 SCOPE

This section includes all materials, labor, equipment and services required for concrete unit masonry in accordance with the Drawings, Construction Specifications and Scope of Work Document.

Where there is a discrepancy between the Drawings and this Specification, the Drawings shall take precedence.

1.2 OTHER PROJECT SPECIFICATION SECTIONS REFERENCED HEREIN

- Cast-In-Place Concrete – 143993-ASA-DD2-SPC-1302
- Special Inspections and Tests – 143993-ASA-DD2-SPC-1305

1.3 PUBLICATIONS REFERENCED HEREIN

All work shall conform to the requirements of these codes and standards, unless noted otherwise.

- 2018 Kentucky Building Code, based on the
- American Society for Testing and Materials (ASTM) latest edition of the standard referenced, unless a specific edition is referenced.
- Underwriters’ Laboratories, Inc., (U.L.), Standard for Concrete Masonry Units, U.L. 618.
- Portland Cement Association, Concrete Masonry Handbook, latest edition.
- The Masonry Society, Building Code Requirements for Masonry Structures (TMS 402-16)
- The Masonry Society, Specification for Masonry Structures (TMS 602-16)
- OSHA Regulations – 29 CFR Part 1910 Occupational Safety and Health Standards
- OSHA Regulations – 29 CFR Part 1926 Safety and Health Regulations for Construction

Any discrepancies between various codes and standards shall be referred to the Engineer for clarification.

1.4 DEFINITIONS

1.4.1 Contractor. Company, partnership or corporation contractually obligated to perform the work outlined in the Drawings, Construction Specifications and Scope of Work Document.

1.4.2 Owner. Big Rivers Electric Corporation

1.4.3 Owner's Representative. The authorized representative of the Owner.

1.4.4 Engineer. Wood Group USA, Inc.

1.4.5 Others. Any vendor, contractor, etc., other than the Contractor and Owner herein defined.

1.4.6 Testing Laboratory. An independent engineering testing laboratory engaged by the Owner to perform testing services required in this specification not otherwise designated, and to perform any other such services requested by the Owner's Representative.

1.4.7 Special Inspections. Inspections required by the International Building Code, Chapter 17, for the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards.

1.5 DRAWING TERMINOLOGY.

The following terminology is generally used on the Drawings to indicate the types of concrete masonry units specified herein.

Specified Type Unit:	Drawing Terminology:
• Hollow Concrete Masonry Units	Concrete Block
• Solid Concrete Masonry Units	Solid Concrete Block
• Architectural Masonry	Split rib block, Split face block, Split face scored, Smooth face block, Smooth face scored

1.6 SUBMITTALS

1.6.1 General.

All submittals required by TMS 602 and those added or modified in this specification shall be to the persons or parties identified in the contract documents.

- Submit coarse grout mix design.
- Submit shop drawings for masonry reinforcement in accordance with Specification 143993-ASA-DD2-SPC-1302, Cast-In-Place Concrete.
- Submit procedures for construction of masonry walls to be filled with coarse grout. Procedures should include high lift or low lift grouting as applicable to the project.
- Upon request, submit material certificates signed by the material supplier that the masonry units, mortar, reinforcement and joint material complies with specification requirements.

1.6.2 Material Samples.

Samples of the following materials shall be submitted for review. Materials shall not be purchased until required samples have been reviewed.

- Anchors and ties: three (3) of each type proposed
- Masonry Units: three (3) representative units of each type of masonry unit to be furnished
- Joint reinforcement: three (3) pieces of each type of reinforcement, 18 inches long, showing at least two cross joints
- Flashing: three (3) pieces of each type not less than 6 inches square

1.6.3 Certificates and test reports for masonry units, mortar, reinforcement, and joint material, in triplicate, approved by the Contractor, shall contain the name and address of the testing laboratory, the dates of the tests or inspections, the name and address of the Contractor, the project location, and the technical information required to show compliance with this specification. Items shall not be purchased until certificates and test reports have been reviewed.

1.6.4 Special Inspections Reports. All special inspections reports shall be prepared and submitted as described in Specification 143993-ASA-DD2-SPC-1305, Special Inspections and Tests.

1.7 SAMPLE PANEL

Prior to beginning masonry construction, the Contractor shall construct for review a sample panel of each type of masonry. Sample panels shall be a minimum of four (4) feet square and will be reviewed for shade range, texture, jointing, soundness of construction and conformity with this specification. All masonry work shall conform to the reviewed sample panels and these specifications. Remove sample panels after all masonry work is accepted.

1.8 GENERAL REQUIREMENTS

All masonry construction and materials shall conform with the requirements of the 2018 Kentucky Building Code, the Portland Cement Association – *Concrete Masonry Handbook*, and TMS 402 and 602.

1.9 DELIVERY

Delivery shall coincide with the construction schedule to eliminate long-term storage at the site. Wrapping, marking, and shipping shall be accomplished in a manner that will prevent damage and clearly identify the material. All concrete masonry units shall be delivered to the jobsite in an air-dry condition. Delivery of damaged material shall not be accepted. Damaged material shall be immediately replaced with new material.

1.10 HANDLING AND STORAGE

Handling and storage shall be accomplished in a manner that will prevent damage. Store all mortar material under cover in a dry place and in the original packaging. Stack all masonry units on plank platforms off the ground. Protect all masonry units stored outside with a waterproof cover.

1.11 SCHEDULING AND COORDINATION

Scheduling and coordination of work specified in this Section with that specified in other sections shall be the responsibility of the Contractor.

1.12 SAFETY

The Contractor and others engaged in performing the work for this specification shall perform their work in a safe manner in accordance with OSHA regulations and all safety requirements of the Owner.

2.0 PRODUCTS

2.1 Concrete masonry shall have the minimum compressive strength (f'm) specified on the Drawings.

2.2 CONCRETE MASONRY UNITS

Concrete masonry units shall be of modular dimensions and special shapes and sizes required to complete the work as indicated. Units shall be of the same color and texture and shall be cured by the same process.

2.2.1 Hollow load-bearing concrete masonry units shall conform to ASTM C90, Type II, unless otherwise noted on the Drawings, made with lightweight aggregates conforming to ASTM C331. Average minimum net area compressive strength of three units shall be 2,000 psi with a minimum net area compressive strength of 1,800 psi for an individual unit.

2.2.2 Solid load-bearing concrete masonry units shall conform to ASTM C90, Type II, unless otherwise noted on the Drawings, made with lightweight aggregates conforming to ASTM C331. Average minimum net area compressive strength of three units shall be 2,000 psi with a minimum net area compressive strength of 1,800 psi for an individual unit.

2.2.3 Concrete building brick shall conform to ASTM C55, Type I, Grade N, unless otherwise noted on the Drawings, made with normal weight aggregates conforming to ASTM C33. Average minimum net area compressive strength of three units shall be 2,500 psi with a minimum net area compressive strength of 2,000 psi for an individual unit.

2.2.4 Fire-retardant concrete masonry units shall conform to Underwriters' Laboratories, Inc., *Standard for Concrete Masonry Units* (UL 618). Furnish UL Certificates for each class of fire-retardant unit required.

2.2.5 Architectural masonry, hollow and solid units shall conform to ASTM C90, Type II, unless otherwise noted on the Drawings, made with lightweight aggregates conforming to ASTM C331. Average minimum net area compressive strength of three units shall be 2,000 psi with a minimum net area compressive strength of 1,800 psi for an individual unit.

2.3 MORTAR

Mortar shall comply with the property specification for Type S mortar as set forth in ASTM C270. Certified test reports shall be submitted for review prior to job use. Average compressive strength of mortar at 28 days shall be 1,800 psi.

2.3.1 Mortar color for architectural masonry shall match the base face color of the unit, unless noted otherwise.

2.3.2 Sand shall conform to the requirements of ASTM C144. Certified test reports by an independent testing laboratory shall be submitted for review prior to job use. Sand shall be purchased from a supplier assuring uniformity of materials throughout the job.

2.3.3 Cementitious materials shall conform to the following specifications. Brand names and content analysis shall be submitted for review prior to purchase.

- Portland Cement: ASTM C150, Type I
- Masonry Cement: ASTM C91
- Hydrated Lime: ASTM C207, Type S
- Mortar Cement: ASTM C1329

2.3.4 Admixture. All mortar for exterior work shall be integrally treated with a water repellant admixture to increase water repellency and reduce efflorescence such as BASF Master Builder's MasterPel 210E or Sika Corporation's "Sikamix W-10 M", in accordance with the manufacturer's recommendations.

2.4 GROUT

Grout for masonry shall conform to ASTM C476 and have a minimum compressive strength of 3000 psi at 28 days. Use only non-shrink, non-metallic grout unless specific conditions warrant otherwise. Unless otherwise indicated on the Drawings, fine grout shall be used in spaces less than 2 inches wide and coarse grout shall be used in spaces 2 inches to 4 inches in width and in vertical cells (where grout filled cells are indicated on the Drawings). Concrete shall be used in spaces over 4 inches in width.

2.5 CONCRETE

Lintel blocks, bond beams, and other reinforced masonry work shall be filled with 4,000 psi concrete conforming to the requirements of Specification 143993-ASA-DD2-SPC-1302, Cast-In-Place Concrete, except that coarse aggregate from ½ inch to No. 4 nominal size shall be used.

2.6 REINFORCEMENT

Reinforcement for masonry construction shall conform to the following:

2.6.1 Rods. Reinforcing steel for lintel blocks, bond beams, and other reinforced masonry work as required, shall conform to ASTM A615, Grade 60, size as indicated or specified.

2.6.2 Joint reinforcement shall be Hohmann & Barnard "220 Ladder-Mesh Reinforcement", Standard Class, mill galvanized, 0.40 ounce zinc coating, with 9 gage side rods and 9 gage cross rods conforming to ASTM A951. Reinforcement for walls two units in thickness shall be Hohmann & Barnard "240 Ladder-Twin-Mesh Reinforcement". Hohmann & Barnard "285 Grip-Lok Ladder Reinforcement" shall be used in cavity walls. Equivalent products of other manufacturers may be submitted for review.

2.7 ANCHORS AND TIES

2.7.1 Anchors and ties, except as otherwise specified herein, shall be zinc-coated ferrous metal of the types noted below. Zinc coating of anchors and ties shall conform to ASTM A153, Class B-1, B-2, or B-3, or ASTM A653 as required for hot-dip galvanizing.

2.7.2 Rigid steel anchors shall be 2 inches wide by $^{1}/_{8}$ inch thick with each end turned down 2 inches for setting into filled cells, unless otherwise noted.

2.7.3 Wall type anchors shall be seismic-notch dovetail type anchors fabricated from sheet steel not lighter than 0.0747 inch (14 gage) in thickness by not less than 1 inch wide with dovetail slot, unless otherwise shown.

2.8 PREMOLDED CONTROL JOINT FILLER

Premolded control joint filler shall be Hohmann & Barnard VS Series PVC control joint type No. VS-8 for 8-inch thick walls, and No. VS-12 for 12-inch thick walls except as noted otherwise on the drawings. Equivalent products of other manufacturers may be submitted for review.

2.9 FABRIC FLASHING

Fabric flashing for heads and sills of openings, bases of walls, spandrel beams and other locations requiring thru-wall flashing shall be “Wasco/York Copper Fabric” flashing with 3 oz. copper as manufactured by York Manufacturing, Inc. or copper-fabric flashing, 3 oz., as manufactured by AFCO Products, Inc.

3.0 EXECUTION

3.1 ACCEPTANCE OF OTHER WORK

Before beginning the installation of materials, the Contractor shall inspect other installed work that may affect the installation of the masonry. The Contractor shall inform the Owner’s Representative of any conditions that would prevent the proper installation of the masonry so that these items may be corrected. Beginning the installation of masonry materials shall indicate the Contractor’s acceptance of other installed work as being acceptable for the proper installation of masonry.

3.2 ERECTION

Masonry shall be laid plumb, true to line, with level courses accurately spaced with a story pole. Running bond shall be laid with the vertical joints of each course centered on a masonry unit in the next course below. Stacked bond shall be laid with the vertical joints of each course in alignment with all courses above and below. Masonry shall be laid in running bond, unless otherwise indicated on the Drawings. Each unit shall be adjusted to its final position in the wall while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and re-laid with fresh mortar. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Courses shall be so spaced that backing masonry (where indicated) will level off flush with the face work at all joints where metal ties are used. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces behind and above metal door frames and around other

built-in items shall be solidly filled with mortar, unless otherwise shown. Anchors, wall plugs, accessories, flashings, and other items required to be built in with masonry shall be built in as the masonry work progresses. Cutting and fitting of masonry shall be done by masonry mechanics with masonry saws. Units shall be dry cut. Walls have generally been laid out to avoid cutting block units and care shall be taken to follow the indicated coursing. All masonry shall be safely shored and braced during construction.

3.2.1 Protection of Masonry. During erection all walls exposed to weather shall be kept dry by covering the exposed tops of walls at the end of each day or shut-down period with suitable waterproof material firmly anchored in place and overhanging at least two feet of the wall on each side. Protection from the weather shall be maintained until the masonry work is completed. No masonry shall be laid when the temperature of the outside air is below 40ºF unless suitable means are provided to heat the masonry materials and protect the complete work from freezing. Protection shall consist of heating the masonry materials to at least 40ºF and maintaining an air temperature above 40ºF on both sides of the work for a period of at least 72 hours.

3.2.2 Joints in exposed-to-view walls or partitions, except joints to be caulked shall be tooled slightly concave with a device having as long a length as practicable so that the mortar will be thoroughly compacted and pressed against the edges of the units. Tooling shall not be done until after mortar has taken its initial set. Joints shall be the same width except for inconspicuous variations required to maintain bond pattern. Control joints, joints between metal frames and masonry and other joints where caulking is required shall be raked out ½ inch and left ready for caulking.

3.2.3 Unfinished work shall be stepped back for joining with new work.

Toothing may be resorted to only when specifically approved by the Owner's Representative. All loose mortar shall be removed and the exposed joint shall be thoroughly cleaned before laying new work. Surfaces of masonry not being worked on shall be properly protected at all times during construction operations.

3.2.4 Expansion and control joints shall be provided as indicated on the Drawings. Vertical control joints shall be constructed in concrete masonry walls at intervals not exceeding 25 feet for interior and exterior walls, unless shown otherwise.

3.2.5 Tolerances for masonry construction based on actual dimensions shall be as follows:

- Variations from the plumb: In the lines and surfaces of columns, walls and arises shall not exceed: ¼ inch in 10 feet; 3/8 inch in any story or 20 feet maximum; ½ inch in any 40 feet or more.
- For external corners, expansion joints and other conspicuous lines: ¼ inch in any story or 20 feet maximum; ½ inch in any 40 feet or more.
- Variation from level: For exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines shall not exceed: ½ inch in any bay or 20 feet maximum; ¾ inch in 40 feet or more.
- Variation of building lines: The maximum variation of the linear building lines from established position in plan and the related portions of columns, walls and partitions shall not exceed: ½ inch in any bay or 20 feet maximum; ¾ inch in 40 feet or more.

- Variation of cross-section dimensions of columns and in the total thickness of walls which are composed of two or more masonry units shall not exceed: minus ¼ inch; plus ½ inch.

3.3 MORTAR

Mortar shall be thoroughly mixed by machine and only in such quantity as is needed for immediate use. Mortar shall be mixed with the maximum amount of water consistent with satisfactory workability for the mason and the strength requirements of the mortar. Overwetting of mixes shall be avoided. While the mixer is in operation, the mortar materials shall be batched in the following order: Add approximately ¾ the required water, ½ the sand, all of the cement, then the remainder of the sand. Allow the batch to mix briefly and then add water in small quantities until satisfactory workability for the mason is attained. The mortar shall then be mixed a minimum time of five (5) minutes after all materials have been added. The mixer drum shall be completely empty before recharging the next batch. Re-tempering of the mortar in the mortar box or board shall be permitted only to replace water lost by evaporation; however, all mortar must be used within one hour of initial mixing of the mortar. All unused mortar left over at the end of the day shall be discharged and not used in the work.

3.4 BLOCKWORK

Exposed concrete masonry units shall be laid in running (½) bond, or stacked bond, as indicated on the Drawings, with full mortar coverage on all bearing walls and webs. Vertical joints shall be thoroughly filled and shoved tight. Units shall be laid in straight and uniform courses.

3.4.1 Joints. Exposed mortar head and bed joints shall have a thickness equal to the difference between the actual and nominal dimensions of the block in either height or length.

3.4.2 Lintels and bond beams shall be constructed of specially formed lintel or U-shaped units filled with concrete, unless otherwise indicated. Reinforce units with not less than two No. 4 bars, unless otherwise indicated, the full length of the lintel. Lintels shall extend 15% of the span beyond each side of the opening but a minimum of 8 inches, unless otherwise noted. Reinforcing at lintel blocks shall be continuous. Reinforcing at bond beams where splices are necessary shall lap a minimum of 48 bar diameters, including at corners.

3.4.3 Vertical cells to be filled shall be aligned to maintain a clear, unobstructed, continuous vertical cell. Vertical reinforcement indicated shall be continuous and rigidly secure at top and bottom and at intervals necessary to hold the reinforcing in proper position. Units containing reinforcement shall be filled with grout as specified herein under PRODUCTS. Fills in vertical cavities shall not exceed four (4) feet in height for any individual lift. Reinforcing bars shall be lapped a minimum of 48 bar diameters at splices.

3.5 JOINT REINFORCEMENT

Joint reinforcement shall be provided in all masonry walls as specified herein and indicated on the Drawings. Reinforcement shall be properly bonded at corners by using prefabricated corner units. Longitudinal laps shall be not less than 12 inches. Reinforcement shall be placed in the first and second bed joints immediately above lintels and below sills at openings and continuously in alternate horizontal joints (16 inches o.c.)

unless otherwise noted. Reinforcement in the first and second bed joints above or below openings shall extend two feet beyond the opening. No joint reinforcement shall pass through vertical masonry control joints.

3.6 FABRIC FLASHING

3.6.1 Fabric flashing shall be installed at the heads and sills of openings, bases of walls, above spandrel beams and at other locations indicated on the Drawings and required by the specifications. The flashing shall be laid in the masonry joints with a layer of mortar above and below the flashing so that total thickness of the two layers of the mortar and the flashing are of the same thickness as the regular mortar joints. Flashing shall terminate ½ inch from the interior or exterior faces of the wall.

3.6.2 Weep holes shall be provided where fabric thru-wall flashing is placed. Weep holes shall be 32 inches apart in the mortar joints of the wall over waterstops as indicated or required.

3.6.3 Weep holes shall be made by placing lengths of No. 10, $^{5}/_{16}$ inch nominal diameter, braided fiberglass cord from the vertical face of the thru-wall flashing to the exterior face of the wall. Cords shall be removed.

3.7 QUALITY ASSURANCE

3.7.1 The Contractor shall retain or otherwise provide inspection and testing facilities to ensure materials and construction comply with the applicable codes, standards, and this specification.

3.7.2 Records of all testing and inspection demonstrating compliance shall be provided to the Owner's Respresentative. The Owner's Representative reserves the right to undertake independent inspection and testing, and the Contractor shall correct any deficiencies identified.

3.8 INSPECTION

3.8.1 The Contractor shall engage the services of a qualified Inspector, acceptable to the Owner's Representative.

3.8.2 The Inspector shall verify compliance with design drawings and specifications and keep a record that shall cover:

- Quality and testing of masonry units and materials for mortar, grout and making of prisms;
- Proportioning, mixing and consistency of mortar and grout;
- Laying, mortaring and grouting of masonry units and masonry structural elements;
- Condition, grade, size, spacing and placing of reinforcement;
- Any significant or unusual construction loads on completed masonry structural elements;
- General progress of work.

3.8.3 When the ambient temperature falls below 40ºF or rises above 100ºF, a complete record shall be kept of weather conditions and of preconditioning and protection given to masonry materials, and protection and curing of completed work.

3.8.4 Records of inspection shall be kept available to the Owner's Representative and Building Official during progress of work and for two years after completion of the project. Records shall be preserved by the Contractor. Copies of all inspection documents shall be provided to the Owner's Representative as the work progresses.

3.9 CLEANING AND PROTECTION

Before completion of the work, all defects in joints of exposed masonry surfaces shall be raked out, filled with mortar and retooled. All masonry surfaces shall be left clean, free of mortar daubs and with tight mortar joints throughout. At the completion of the project all exposed masonry shall be thoroughly cleaned in accordance with the manufacturer's recommendations and subject to review. If corrosive cleaning materials are used all sash, metal lintels and other corrodible parts shall be completely protected.

3.10 SPECIAL INSPECTION

Special inspections and tests of masonry construction shall be performed in accordance with the quality assurance program requirements of TMS 402 and TMS 602 as stated in Section 1705.4 "Masonry Construction" of the 2018 Kentucky Building Code.

In addition, refer to Specification 143993-ASA-DD2-SPC-1305, Special Inspections and Tests.

END OF SECTION

Big Rivers ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix F – Rev 2

Electrical Specifications

(New Documents/Revisions are Denoted by ____ *)

Appendix	Document Number	Document Title	Document Revision	
F	143993-ASA-DF0-PRO-1700	ELECTRICAL NUMBERING PROCEDURE	A	
F	143993-ASA-DF0-SPC-1701	ELECTRICAL WORK - CONSTRUCTION SPECIFICATIONS	1	*

TITLE:	**Electrical Numbering Procedure**	DOC. NO.	**143993-ASA-DF0-PRO-1700**	REV. **A**
PROJECT NAME:	**DB Wilson - FGD Relocation**	PROJECT NO:	**WOOD ASA - 245891**	
CLIENT:	**Big River Electric Corporation**	AREA NO:		

APPROVAL STATUS							
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CHECKED BY	JBF	**DATE**	09FEB21	**APPROVED BY**		**DATE**	

REVISION STATUS						
REV	**ISSUED FOR**	**REVISED BY**	**CHECKED BY**	**APPROVED BY**	**ISSUED BY**	**DATE**
A	Issued for Approval	JTB	JBF	ARS	JTB	11FEB21

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1 DISCIPLINE LAYOUT DRAWINGS

1.1.1 Layout drawings will conform to BREC standards provided by the Project Manager.

2 ENGINEERING DELIVERABLES AND WIRING DRAWINGS

2.1.1 Electrical deliverables and wiring drawing numbering will conform to BREC standards provided by the Project Manager.

3 CABLE IDENTIFICATION SYSTEM (EPC PROVIDED)

3.1.1 Each piece of electrical equipment shall have a unique alphanumeric identification. The identification will be a combination of groups mentioned below.

3.1.2 The Electrical cable includes the Service Code, Voltage/Segregation Code, Sequence following by Redundant/Parallel Identifier.

SSSSVVXXXXYY

SERVICE CODE (SSSS)	This group represents the equipment system for different cables. Refer to Section 7.1.3 below.
VOLTAGE/SEGREGATION (VV)	This group represents the voltage/segregation code for different cables. Refer to Section 6.1.2 below for designation.
SEQUENCE NUMBER (XXXX)	This group of characters represents the equipment cable number assigned as a sequence number. 4-digit number XXXX.
REDUNDANT/PARALLEL (YY)	This group of characters represents the equipment cable number designation assigned when there are parallel conductors or redundant conductors. 2-digit alphanumeric character YY. Ex. A1, A2, B1, B2, C1, C2.

3.1.3 Examples of Electrical cables are shown below:

Example:
LRSEM0001A1 – Recycle Pump Motor Feeder, Phase A, Conductor 1 of multiple

4 CABLE IDENTIFICATION SYSTEM (VENDOR)

4.1.1 Vendor cables, both provided/pulled by vendor and by EPC, will be tagged as shown on vendor drawings.

5 WIRE NUMBERING SYSTEM

5.1.1 Each wire should have an alphanumeric identification. The identification will be a combination of groups separated by dashes. The wire includes the Cable number followed by Conductor number.

CABLE #-XX

CONDUCTOR	The conductor label shall be a subset of the cable number with 2-digit number “XX”. CABLE #-XX (where “XX” is a conductor number or color) Example: 7/C #14 OS: LRSC0001-01 LRSC0001-02 LRSC0001-03 LRSC0001-04 LRSC0001-05 LRSC0001-06 LRSC0001-07 LRSC0001-OS

6 RACEWAY NUMBERING SYSTEM

6.1.1 Each Raceway shall have an alphanumeric identification consisting of the Segregation Code, a Raceway Identifier, and a sequential numerical suffix. Duct bank shall not use a Segregation Code. This will be omitted from the tagging of duct bank.

6.1.2 Segregation Codes (VV):

EH	6.9KV cables
EM	4160V cables
ES	600V AC and below and 4/0 AWG and larger cables
E	600V AC and 125V AC/DC, #12 - #4/0 AWG
C	125V AC/DC Control cables (#14 AWG and #16 AWG)

I	Instrumentation and Signal cables (48V DC and below, Fiber Optic, Network and Analog cables)
EF	Fiber Optic Cables

6.1.3 Raceway Identifier:

C	Above Ground Conduit
T	Cable Tray
D	Underground Duct or Conduit
EDB	Underground Electrical Duct Bank

6.1.4 XXX – Sequential Numbering

6.1.5 Assigning Tray numbers:

When a tray joins another tray, the sequence number should change.

Identification label for each tray shall be provided every 20 feet and when the tray branches off. The label shall be with black letters on yellow background unless otherwise directed.

6.1.6 Raceway numbering examples

Cable Tray – EST001 – Cable Tray containing 600V cables 4/0 AWG and larger.

Above Ground Conduit – IC001 – Above Ground Conduit containing Instrumentation or Signal cables.

Underground Duct or Conduit – CD001 – Underground Conduit containing Control cables.

Duct Bank – 001EDB001 – Underground Electrical Duct Bank

7 EQUIPMENT NUMBERS

7.1.1 Electrical Equipment tagging shall follow the designation below. All Equipment tags shall consist of Equipment Code, Service Code, and Sequential Number starting with “0001”.

AAA-	YYYY-	####
Equipment Code	Service Code	Sequential Number starting at "0001"

7.1.2 Electrical Equipment Codes:

- XMFR – Transformer
- PNL – Panel
- JB – Junction Box
- DCS – Distributed Control System
- HTR – Heater
- TB – Terminal Box

- PDC – Power Distribution Center
- GSU – Generator Step Up Transformer
- DSW – Disconnect Switch
- LF – Light Fixture
- RCP – Receptacle
- CNT – Contactor
- VFD – Variable Frequency Drive
- NGR – Neutral Ground Resistor
- WR – Welding Receptacle
- PB – Pull Box
- CP – Control Panel
- SWG – Switchgear (LV and MV)
- MCC – Motor Control Center
- MH – Electrical Manhole
- MTR – Motor
- BAT – Battery
- INV – Inverter
- FBX – Fiber Patch Panel
- MC – Marshalling Cabinet
- BKR – Circuit Breaker
- CAM – Security Camera
- CR – Card Reader
- PE – Photo Electric Eye
- PBS – Pushbutton Station
- SAR – Surge Arrestor
- SBP – Sub-Panel
- TRS – Transfer Switch

**Other Equipment Codes may be added through the duration of the project in order to best suit equipment that may not be accounted for here.

7.1.3 Service Codes:

SERVICE CODES	
ASD	Absorber Area Sump
CFD	Chemical Feed
DSD	Dewatering Area Sump
EEP	Essential AC & DC Power Supply
EFP	Freeze Protection
EG	Emergency Generation
EGN	Generator Equipment
EP	Power Distribution
EPH	High Voltage (4160V and above) Power Distribution

EPL	Low Voltage (480V) Power Distribution
EQ	Construction Power
ESM	Station Miscellaneous
EW	Welding Circuits
FIL	Vacuum Filter Filtrate
FOA	Forced Oxidation Air
IAI	Instrument Air
LGR	Ball Mill Grease System
LHY	Recycle Pump Hydraulic System
LOL	Lube Oil
LRS	Recycle Slurry
LSS	Reagent Feed & Storage
LWS	Dewatering
LWS	Waste Slurry
RSD	Reagent Area Sump
SAI	Service Air
SDD	Stack Drain
VAC	Vacuum Filter Vacuum
VGA	Vacuum Filter Gliding Air
WFW	Filtered Water
WPT	Row Water
WPW	Potable Water
WQW	Quench Water
WRW	Reclaimed Water
WSW	Service Water
WVF	Vacuum Filter Wash Water
WWA	Mist Eliminator Wash
WWW	Waste Water

CONSTRUCTION SPECIFICATIONS

Electrical Work	**143993-ASA-DF0-SPC-1701**
Big Rivers Electric Corp.	Rev. 1
Centertown, Kentucky	Project No. 245891

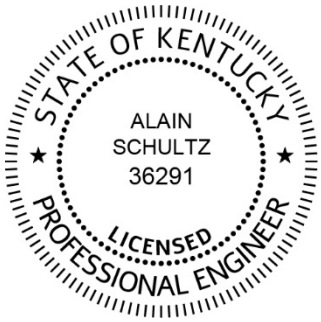
APPROVAL STATUS							
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RELEASE STATUS

REV	DESCRIPTION	REVISED BY	CHECKED BY	ISSUED BY	DATE
0	Issued for Construction		AJG	ARS	5-14-21
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Permit Stamp

Owner's Engineer's Seal



Electrical Work	**143993-ASA-DF0-SPC-1701**
Big Rivers Electric Corp.	Rev. 1
Centertown, Kentucky	Project No. 245891

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ELECTRICAL WORK

1. GENERAL

1.1. SCOPE

1.1.1. The work to be performed under this section of the specifications includes the furnishing of all materials, labor, supervision and tools necessary to install complete electrical systems in good operating order and in accordance with the specifications, the drawings, and the other contract documents. Items not specifically shown on the drawings or mentioned in the specifications, but essential to the proper completion of the work, shall be furnished and installed as if specified and shown.

1.1.2. Ground elevation at the job site will be 392 feet above sea level.

1.2. CODES, ETC.

1.2.1. All electrical work under the requirements of these specifications shall be in conformance with the National Occupational Safety and Health Administration requirements; the requirements of the current editions of the National Electrical Code and the National Electrical Safety Code; and shall also be in compliance with all applicable state and/or local laws and ordinances.

1.2.2. In preparing his bid, the contractor shall carefully check the plans and specifications for compliance with applicable codes and other legal requirements. He shall inform the Owner's Engineer in writing of any nonconformance before he submits his bid.

1.2.3. The contractor shall cooperate with and assist the Owner's Engineer in securing from the authority enforcing the codes any "Special Permission" or interpretation needed to complete the work.

1.3. DRAWINGS

1.3.1. The locations shown on the drawings are, unless dimensioned, only approximate, and the contractor shall select the actual locations for installation with due consideration for the features of the construction and the work of other trades. Where locations are dimensioned on the drawings, they may be changed only with the approval of the Owner's Engineer.

1.3.2. If interferences are found between the electrical work and that of other trades, the Owner's Engineer shall decide which must be relocated.

1.3.3. The contractor shall keep a complete set of prints in good condition, and on these shall indicate all field changes made. The drafting of changes on the prints shall be done neatly with the aid of appropriate drafting tools, so that they are legible and readily understood. These prints shall be turned over to the Owner's Engineer at the completion of the project.

1.4. WORKMANSHIP

Workmanship shall be first quality and in accordance with the best practices of the trade. Only workmen skilled in the tasks assigned to them shall be employed.

1.5. MATERIAL

Material furnished for inclusion in the work shall have been designed, built and tested in accordance with applicable NEMA and IEEE standards; shall be approved and labeled by the Underwriters' Laboratories, Inc., if label service is available; and shall be new. Where reference is made, either in these specifications or on the drawings, to a particular manufacturer's product, the substitution of a similar product of the specified manufacturer or of a different manufacturer may be made only with the approval of the Owner's Engineer.

1.6. MATERIALS FURNISHED BY THE OWNER

1.6.1. The following listed apparatus will be furnished by the Owner:

- 4160V switchgear
- 125VDC battery and battery charger
- UPS
- 480V switchgear
- Low-voltage motor control centers
- AC variable speed drives
- Oil filled transformers
- Generator neutral (circuit breaker and) grounding resistor

1.6.2. The items listed above shall be received and unloaded from the carrier at the jobsite, placed in storage, removed from storage, transported to their assigned locations, set in place and installed by the contractor.

1.6.3. The contractor shall inspect all material for damage and shortage, and if either is found shall complete and file a "Claim Report" with the Owner or Owner's

representative. The contractor shall be responsible for any demurrage or recall charges on rail cars or trucks if the charges are occasioned by his failure to unload them in due time.

1.6.4. The contractor shall be responsible for the proper storage of all items. When apparatus designed for indoor use must be stored outdoors, it must be elevated above ground level and covered to exclude rain water. The rainproof covers shall not extend to the ground but must be arranged to permit a flow of air under the apparatus. Electric heaters, which may be incandescent lamps, shall be installed inside control centers, switchgear, operators' consoles, relay panels, etc., not furnished with heaters. All heaters shall be energized 24 hours a day while the apparatus is in storage.

1.6.5. The shafts of all motors shall be rotated one half turn at least once in each six-week period. The person performing this service shall write his initials and the date of each service on a tag to be attached to the motor.

1.7. MATERIALS AND WORK BY OTHERS

The contractor shall furnish all other required materials not specifically enumerated to be furnished by the Owner. Contractor furnished items shall include, but are not limited to, those specified in Section 2.

1.8. PERMANENT LIGHTING

The contractor shall make every reasonable effort to complete the permanent lighting installations in each area at an early date, in order that the requirements for temporary lighting facilities may be minimized and that advantage may be gained from better lighting systems.

1.9. INTERRUPTIONS OF POWER AND CONNECTIONS TO EXISTING BUSES

1.9.1. The work is to be carried out without unnecessary interference with the Owner's existing facilities and operations. Power interruptions shall be scheduled with the Owner or Owner's representative and shall be taken only during those periods which he has approved in writing.

1.9.2. When another power system, or source, is to be connected to an existing system, it shall be the contractor's responsibility to determine that the phase relations and voltages at the connection point are such that the two systems can operate satisfactorily in parallel.

1.9.3. The contractor shall demonstrate, with the aid of suitable instrumentation, that the connections he has made at tie breakers are correct before an attempt is made to synchronize the two systems and close the breaker.

1.9.4. Any power switching shall be coordinated with the Owner and done in full compliance with the Owner's safety procedures.

1.10. ADDITIONAL INFORMATION TO BE ISSUED TO THE CONTRACTOR

The information given on the drawings, lists, schedules and other documents issued with the "Invitation to Bid" is thought to be quite sufficient to enable the contractor to prepare his estimate and bid and to begin the work. Other drawings, detail sheets, lists, etc., may from time to time be issued to the contractor to clarify the requirements of his work and simplify its execution. Such additional drawings and other supplementary information will not be considered acceptable grounds for a claim for extra work, unless they show work not previously shown or clearly inferable from the documents issued with the "Invitation to Bid," or unless the work in connection with any item previously shown or listed therein is increased.

1.11. TYPICAL INSTALLATION DETAILS

Installation details showing typical motor connections, lighting fixtures, cable tray supports and other features of work are included as a part of these specifications and will be issued on full size drawings.

1.12. WIRING METHODS

The wiring method and cable type for all power and control wiring are described on the cable schedules. In general, medium-voltage cables will be single conductor installed in aluminum cable trays. Most other wiring will be multiconductor cables installed in aluminum cable trays or single conductor cables installed in rigid aluminum conduit. Unless otherwise noted on the drawings, all cable trays and above ground raceways shall be aluminum, and all underground raceways shall be PVC. Intermediate metal conduit and EMT shall not be used, unless specifically called for on the drawings.

1.13. VENDOR DRAWINGS AND INSTALLATION MANUALS

The contractor shall review and follow manufacturer's recommendations for all equipment. Any discrepancy between the vendor information and the installation drawings shall be referred to the Owner's Engineer.

2. MATERIALS AND EQUIPMENT

2.1. CONDUIT

2.1.1. Rigid aluminum conduit, couplings and elbows shall be manufactured of a suitable copper-free aluminum alloy. Conduit lengths shall be seamless throughout and shall

have hard, smooth and gum-free interior coatings to facilitate the pulling-in of conductors. It shall be furnished in nominal 10-foot lengths, with both ends threaded and a coupling applied to one end of each stick. Threads on the coupling end shall be coated with a special lubricant so that the coupling may be removed without difficulty. Threads on the end opposite the coupling shall be protected from damage by a plastic cap.

2.1.2. Plastic coated flexible conduit shall be constructed with a flexible core of galvanized steel and an overall PVC jacket to form a liquid-tight raceway. The overall jacket shall be wrinkle-free and suitable for use in temperatures from -40°C to +100°C. Flexible conduit shall be “Sealtite” type UA as manufactured by ANAMET Electric, Inc., or a product of equal construction specifically approved by the Owner’s Engineer.

2.1.3. Plastic conduit shall be heavy wall Schedule 40 tubing of polyvinyl chloride, furnished in 10 or 20-foot lengths, with one coupling applied to each stick. Plastic conduit shall be similar and equal to Type 40 PVC conduit as manufactured by Carlon, or a product of equal construction specifically approved by the Owner’s Engineer. PVC conduit stub-ups shall be Schedule 80.

2.1.4. Accessories. For all fiber and plastic conduit, the contractor shall provide, as required, factory-made end bells, bends, adapters, etc., and for concrete encased runs, plastic spacers, ties and steel hold-down stakes.

2.2. CONDUIT FITTINGS

2.2.1. Bushings. Insulated bushings for conduit sizes 1¼ inches and larger shall have metal bodies and threads, with molded-on high impact phenolic thermosetting insulation to prevent conductor insulation damage. The metal body shall be of the same material as the conduit to which it is attached. Bushings shall be Type “B” insulated bushings as manufactured by O.Z. Gedney, or a product of equal construction specifically approved by the Owner’s Engineer. Insulated bushings for conduit sizes 1 inch and smaller may be of plastic, O.Z. Gedney Type “A,” or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.1.1. Insulated grounding bushings shall be similar to the insulated bushings described above, except they shall have set screws to lock the bushings on the conduits and shall have mechanical type lugs attached. Lugs shall be sized to accept the ground wire sizes as set forth in the latest edition of the National Electrical Code, but in no case smaller than No. 8 AWG wire. Grounding bushings shall be Type “BLG” as manufactured by O.Z. Gedney, or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.1.2. Male bushings shall be insulated throat chase nipples. Bushings used only to pass

conductors through metal partitions, etc. shall be O.Z. Gedney Type “ABB,” or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.2. Condulets for use with aluminum conduit shall be of copper-free aluminum alloy. Those for use with steel conduit may be of galvanized, or cadmium plated cast iron, or of copper free aluminum alloy. All condulet fittings shall be provided with neoprene gaskets and sheet metal covers, except that cast covers shall be used for sizes 1¼ inches and larger. Cover screws shall be captive. All condulet fittings shall be Crouse Hinds Form 8 or Mark 9, or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.3. *Outlet Boxes*. All exposed or surface mounted outlet boxes shall be cast metal of the proper size and type for the conditions involved. Galvanized sheet metal outlet boxes with no open knockouts may be used for concealed or recessed mounting in dry locations.

2.2.4. *Hubs*. Watertight conduit connections are required on all electrical equipment located outside or in process areas. Where hubs or watertight threaded connections are not provided as a part of the enclosure and are required, watertight hubs shall be installed. Watertight hubs shall be Myers “Scru-tite,” or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.5. *Junction Boxes.* Junction boxes shall be of code gage metal with continuously welded joints or of cast metal as called for on the drawings. All junction boxes shall have gasketed screw covers. Boxes for use with aluminum conduits shall be of aluminum. Sheet steel boxes shall be galvanized after fabrication. Screws for galvanized steel box covers shall be made of brass. Screws for aluminum box covers shall be stainless steel.

2.2.6. *Pull Fittings*. Type “LB,” “C” and “TB” condulet fittings may be used as pull fittings on individual conduits, where the conductor size does not exceed No. 2 AWG for 600 volt insulation. Pull boxes shall be sized in accordance with the requirements of the latest edition of the National Electrical Code and shall be O.Z. Gedney, Type “PBW,” Appleton Electric Company, Type “PTC,” or a product of equal construction specifically approved by the Owner’s Engineer.

2.2.7. *Expansion Joint Fittings*. All expansion joint fittings shall be of the same metal as the conduit involved and shall be O. Z. Gedney, Type “AX,” or a product of equal construction specifically approved by the Owner’s Engineer. All expansion joint fittings shall be furnished complete with bonding jumpers.

2.2.8. *Conduit Unions*. Where conduit unions are required in a run, Thomas and Betts Corporation, Erickson couplings may be used, except that unions in outdoor conduits or in conduits in wet areas shall be watertight.

2.2.9. Cable supports to be used in vertical conduit runs shall be O.Z. Gedney, Type "R," or a product of equal construction specifically approved by the Owner's Engineer.

2.2.10. Fittings for plastic coated, flexible conduit shall be Appleton Electric Company, Type "STB," or a product of equal construction specifically approved by the Owner's Engineer.

2.3. WIRE AND CABLE

2.3.1. *Refer to Wire and Cable specification 143993-ASA-DF0-SPE-1715.*

2.4. CABLE FITTINGS

2.4.1. Fittings for use on armored cables shall be American Connectors, Inc., "Per-fit" or Thomas and Betts Corporation, "Spin-on." All armored cable fittings used in outdoor or process areas shall be watertight types and shall be completely sealed with Raychem's, Type WCSM-S, heavy wall cable sleeves after installation.

2.4.2. Fittings for use with non-armored cable shall be Appleton type "CG," Crouse-Hinds Type "CGFP," or a product of equal construction specifically approved by the Owner's Engineer.

2.5. CABLE SUPPORT SYSTEMS

2.5.1. *General.* Metallic cable tray systems shall comply in all respects with the latest edition of NEMA Standard VE-1. Fiberglass cable tray systems shall comply with the latest edition of NEMA Standard FG-1.

2.5.1.1. Metallic cable trays shall be manufactured by B-Line Systems, T&B, Chalfant Manufacturing, Cope Cable Tray, MP/Husky, or P-W Industries. Cable trays manufactured by other firms may be used, if specifically approved by the Owner's Engineer.

2.5.1.2. The cable tray designs shown on WOOD drawings are based upon products produced by MP Husky, with a side rail height of 6 inches and a $1^{3/4}$ inch wide C channel shaped flange. If cable trays other than these are installed, the contractor shall be responsible for coordinating the tray system with all other designs to avoid interferences.

2.5.1.3. Cable trays installed indoors shall be rated to support a minimum of five pounds per inch of width per foot of length with a safety factor of 1.5 when supported as a simple beam with the maximum distance between supports as described below. Cable trays installed outdoors shall be rated to support seven pounds per inch of width per foot of length with a safety factor of 1.5 when supported as a simple beam with the maximum distance between supports as described below. The maximum distance between supports for aluminum trays shall not exceed ten feet. When cable trays are loaded as

described above, the deflection of the bottom of a side rail at mid span shall not exceed 1.5 inches. The deflection of any rung at mid span shall not exceed 0.3 inches.

2.5.1.4. Cable trays and fittings shall be ladder type with rungs spaced 12 inches on centers for power cables and 9 inches on centers for control and signal cables. The inside bend radii of all fittings shall be 24 inches, unless otherwise noted on the drawings. The usable clear loading depth shall be 5 inches. Straight sections shall be furnished in lengths of 24 feet. Cable support channels shall be 4 inches wide, unless otherwise noted on the drawings.

2.5.1.5. All metallic cable tray systems shall be constructed of 6063-T6 aluminum alloy, unless otherwise noted on the drawings.

2.5.1.6. All horizontal and vertical fittings shall have the same thickness and cross sectional areas of side members and rungs as straight sections. The tray design shall be such that adjacent sections can be joined together without the use of special tools.

2.5.2. Aluminum cable tray and fittings shall be of extruded aluminum alloy sections and of the widths shown on the drawings.

2.5.3. Aluminum cable channels shall be of extruded aluminum alloy, stress free and bottom ventilated.

2.5.4. All cable tray support fittings shall be of the same material as the tray they are to support, except that threaded rods, bolts, beam clamps, conduit clamps, structural shapes, etc. for metallic cable trays, shall be of steel with a hot dipped galvanized finish.

2.6. NOT USED

2.7. WIRING DEVICES

2.7.1. Toggle switches shall be specification grade rated 20 amperes at 120-277 volts, ac. Switches shall be Arrow-Hart Catalog No. AH1221, AH1222 or AH1223, depending on the type of switch required for the application involved, or a product of equal construction specifically approved by the Owner's Engineer.

Convenience outlets shall be three-wire grounding type rated 15 amperes at 125 volts ac or dc. Duplex receptacles, for use in manufacturing areas, shall be Arrow-Hart Catalog No. 5262-CR, or a product of equal construction specifically approved by the Owner's Engineer. Receptacles for use in offices and other clean, dry areas shall be Arrow-Hart Catalog No. 5252, or a product of equal construction specifically approved by the Owner's Engineer.

2.7.2. Receptacles connected to branch circuits served by instrument power panels with an isolated equipment grounding system shall be Arrow-Hart Catalog No. IG5262 for

straight blade plugs or IG4700 for locking type.

2.7.3. Welding receptacle installations shall include an interlocked receptacle disconnect switch with viewing window. The disconnect switch shall be fused with 60A class "J" fuses and mounted in a NEMA 4/4X enclosure right above the welding receptacle. Welding receptacle shall be rated 60 amperes, three-wire, four-pole at 480 volts, 60 hertz.

2.7.3.1. Welding receptacle plugs shall be rated 60 ampere, four-wire, three-pole, with a grounded body.

2.7.3.2. Unless otherwise noted, one plug shall be furnished for each three receptacles shown on the drawing.

2.7.4. Clock outlets shall be single two-pole, three-wire, 15 ampere, 125 volt receptacles with stainless steel plates. Receptacles shall be Arrow Hart Catalog No. 5708, or a product of equal construction specifically approved by the Owner's Engineer.

2.8. LOW-VOLTAGE CIRCUIT PROTECTING DEVICES

2.8.1. *Molded Case Circuit Breakers*. Individual molded case circuit breakers located in clean, dry areas shall be furnished in NEMA 1 enclosures. Circuit breakers shall be furnished in NEMA 4X fiberglass reinforced polyester enclosures if they are to be located outdoors or in process locations. Breaker continuous and interrupting ratings shall be as shown on the drawings, or as specified elsewhere herein, but in no case shall the interrupting rating be less than 65,000 symmetrical rms amperes at 480 volts. Breaker frames larger than 100 amperes shall have interchangeable trip units. An auxiliary pole or interlock shall be furnished when indicated on the drawings.

Fused type circuit breakers shall combine conventional thermal-magnetic molded case circuit breakers with current limiting type fuses. The fuse-breaker combination shall be coordinated so that the circuit breaker shall provide protection against overloads and short-circuits within its interrupting capacity with the current limiting fuses opening only to clear high level currents above the rating of the circuit breaker. The unit shall be so designed that if any fuse blows the breaker will trip, opening all three poles preventing a single phase condition. Fuse breaker combination shall be General Electric Company "Tri-Break," Cutler-Hammer/Westinghouse, "Tri-Pac," or a product of equal construction specifically approved by the Owner's Engineer.

2.8.2. Fused safety switches shall be of a heavy duty type with an interlocked cover, positive quick-make, quick-break mechanism, and visible blades. Fused safety switches shall have rejection type fuse clips and UL Class "RK" fuses. The switch shall have a NEMA 12 enclosure, except that NEMA 4X fiberglass reinforced polyester enclosures shall be used outdoors or in other process area locations. The

switch shall have provisions for padlocking the operating arm in the “off” position and for padlocking the front cover closed. The number of poles and the ampere ratings of the switch and fuses shall be as indicated on the drawings or as required for the application involved. (An auxiliary pole or interlock shall be furnished when indicated on the drawings.)

2.8.3. Non-fused safety switches shall be heavy duty type, horsepower rated, three-pole, motor circuit switches. Contacts shall be completely visible with the cover open and shall be of a quick-make, quick-break type. The switch shall have provisions for padlocking the operating handle in the “off” position with the front cover in the closed position. The switch enclosure shall be NEMA 12, except that switches for use in outdoor or process locations shall have NEMA 4X, fiberglass reinforced polyester enclosures. All switches shall be rated for use at 600 volts and shall be of the ampere rating required for the application involved.

2.8.4. Double throw safety switches shall be of the heavy duty type, 600 volt, horsepower rated and with NEMA 12 enclosures. All switches shall have quick-make, quick-break mechanisms and shall have provisions for locking the operating handle in the top, open or bottom positions.

2.9. LOW-VOLTAGE MOTOR CONTROLLERS

2.9.1. Full voltage induction motor controllers shall be combination type with three-pole circuit breakers and magnetically operated contactors. All motor controllers shall have a minimum interrupting capacity of 65,000 symmetrical rms amperes at 480 volts. Each controller shall contain an individual control power transformer for 120 volt control circuits. All control power transformers shall have the ungrounded secondary lead fused and both primary leads fused. Controllers for single speed motors shall have three thermal overload devices each. Multispeed motor controllers shall have a separate set of thermal overloads for each motor speed. Overloads shall be sized in accordance with the full load running current of the motor at the particular speed involved. Reversing type controllers shall have mechanical and electrical interlocks between forward and reverse contactors.

2.9.1.1. The insulation on all internal wiring in controllers shall be of a self-extinguishing, thermosetting type, with a conductor temperature rating of at least 90°C.

2.9.1.2. Individually mounted motor controllers shall have NEMA 12 enclosures, except that when mounted outdoors or in process locations they shall have NEMA 4X fiberglass reinforced polyester enclosures. All controllers shall have provisions for the external hand resetting of their thermal overloads.

2.9.2. *Motor Control Centers*. Low-voltage motor control centers will be NEMA Class 1, Type B wired, with NEMA 1 enclosures with gasketed doors. They shall be suitable

for service on 480 volt, three-phase, 60 hertz systems.

2.9.2.1. Controllers will be full-voltage, combination type with circuit breakers. Controllers shall have a minimum interrupting rating of 65,000 rms amperes symmetrical at 480 volts.

2.9.2.2. Controllers will be grouped in the required number of vertical sections, each section being approximately 90 inches high, 20 inches wide. These sections shall be bolted together to form rigid, free-standing units. Normally, controllers will be mounted on the front side only, but where indicated on the drawings back-to-back mounting may be used.

2.9.2.3. Each controller compartment will have its own door on which will be furnished an embossed laminated plastic nameplate giving an equipment number and name or other information as indicated on the drawings.

2.9.2.4. Overload Protection:

When indicated on Data Sheet bi-metallic over loads shall be provided. Overload relays shall be an ambient compensated bimetallic-type with interchangeable heaters, calibrated for 1.0 and 1.15 service factor motors. Electrically isolated normally open and normally closed contacts shall be provided on the relay. Visual trip indication shall be standard. A test trip feature shall be provided for ease of troubleshooting and shall be conveniently operable without removing components or the motor starter. Overload to have (+/-) 24% adjustability, single-phase sensitivity, isolated alarm contact, and manual or automatic reset.

2.9.3. Manual motor controllers for single-phase, fractional horsepower motors shall be single or two-pole, as required, and rated for the proper voltage. Each shall have one thermal overload device and shall be General Electric CR101Y or CR101H, or a product of equal construction specifically approved by the Owner's Engineer. Manual motor starters in outdoors or other process areas shall be furnished in NEMA 4X fiberglass reinforced polyester enclosures.

2.10. Not used

2.11. SWITCHGEAR

2.11.1. Low-voltage metal-enclosed switchgear will be for indoor use and arranged as shown on the drawings. Breakers will be air-break, draw-out mounted, with static overcurrent tripping devices in each pole and stored energy type closing mechanisms. Breaker interrupting capabilities, frame sizes, trip ratings and operation (manual or electrical) will be as shown on the drawings or documents used to release equipment for manufacture. Refer to specification 143993-ASA-DF0-SPE-1703 for the LV switchgear.

2.11.2. Medium-voltage metal-clad switchgear will be for indoor use and arranged as shown on the drawings. Breakers will be vacuum-break, draw-out mounted, with stored energy closing devices, ac or dc trip and close. Breaker interrupting capabilities, voltage and ampere ratings, instrumentation, relaying and other details will be as given on the drawings or documents used to release equipment for manufacture. Refer to specifications 143993-ASA-DF0-CWP-1701 and 143993-ASA-DF0-CWP-1702 for the MV switchgear.

2.11.2.1. A 125 volt battery with a rack and an automatic charger will be furnished to provide power for dc circuit breaker control. Refer to specification 143993-ASA-DF0-SPE-1717 for the 125VDC system.

2.12. LOAD CENTER UNIT SUBSTATIONS

Load center unit substations generally will consist of the following principal parts:

2.12.1. A medium voltage vacuum breaker in switchgear.

2.12.2. Cable for incoming and outgoing connections.

2.12.3. A three-phase, 60-hertz, air cooled, two winding, less-flammable liquid-insulated (bio-degradable FR3) transformer, delta-wye connected with secondary neutral brought out, NEMA standard taps and accessories. Voltages and kVA ratings will be as noted on the drawings.

2.13. TRANSFORMERS

2.13.1. Small dry type transformers to provide power for lighting, convenience outlets, heating, etc. shall be wall or platform mounted and shall have NEMA standard taps. Primary and secondary voltages, phases and transformer ratings shall be as indicated on the drawings. Sizes 25 kVA and smaller shall be totally enclosed and Underwriters Laboratories listed for indoor or outdoor installation. Sound levels shall not exceed those listed by NEMA-ANSI standards for general purpose transformers.

All dry type transformers shall have an insulation system with a maximum temperature rating of 220°C. All transformers shall be designed to produce rated output with an average conductor temperature rise of 80° in a 40°C ambient temperature. All transformers shall be furnished with four primary voltage taps: two 2½% and 5% above and two 2½% and 5% below rated voltage. All dry type transformers shall be of General Electric, Square D, Eaton, or a product of equal construction specifically approved by the Owner's Engineer.

2.14. GROUNDING EQUIPMENT

2.14.1. Ground rods shall be ¾ inch in diameter x 10 feet long and manufactured of high

strength copper clad steel. Where ground rods greater than 10 feet in length are required, sectional ground rods with both ends threaded and connected with threaded bronze couplings shall be used. Ground rods shall be as manufactured by Copperweld Steel Company, or a product of equal construction specifically approved by the Owner's Engineer.

2.14.2. Grounding connectors for wire-to-wire or wire-to-ground rods shall be made by "Cadweld" process or with Thomas and Betts Corporation compression type ground grid connectors. Grounding connections to pipes or flat surfaces shall be made by "Cadweld" process or with Burndy Type GAR connectors (for pipe) and types GB or GC for cable to flat surfaces. Refer to the grounding drawings for additional grounding equipment and installation requirements.

2.14.3. All grounding connections shall use semi conductive dielectric grease and/or anti-corrosion inhibitors per industry standards.

2.15. MOTORS

2.15.1. Motors will, unless otherwise noted, will be furnished by the Owner or with the equipment they drive.

2.16. NOT USED

2.17. PANELBOARDS

2.17.3. Panelboards shall be of the dead-front type, with molded case circuit breaker branches. Details of construction including service voltage, number and ratings of branches, size of mains and whether surface or flush mounting are given on the drawings or in the schedules. Distribution panelboards shall be Eaton Pow-R-Line C, or a product of equal construction specifically approved by the Owner's Engineer. Panelboards for lighting shall be Eaton Pow-R-Line 1 for 120/240 and 208Y/120 volts, or Pow-R-Line 2 or 3 for 480Y/277 volts, or a product of equal construction specifically approved by the Owner's Engineer.

2.17.4. All panelboard locks shall be keyed alike. Circuit breakers used to switch lighting shall be approved for switching service. Any other branch circuit breakers in the same panelboards used to protect receptacle circuits, circuits to unit heaters and other non-switched loads shall be provided with handle locks to prevent the inadvertent opening of these circuits.

2.18. DEVICE PLATES

2.18.1. Device plates for use on flush mounted boxes in offices and other finished areas shall be "specification grade" stainless steel as manufactured by Arrow Hart, or a

product of equal construction specifically approved by the Owner's Engineer. For surface mounted outlet boxes in dry areas, device plates shall be of galvanized sheet steel with beveled edges and countersunk screw holes.

2.18.2. Covers for use outdoors and in manufacturing areas shall be of cast metal and gasketed. Convenience outlet covers shall be Crouse-Hinds WLRD-1, WLGF or a product of equal construction specifically approved by the Owner's Engineer. Tumbler switch covers shall be Crouse-Hinds No. DS181, or a product of equal construction specifically approved by the Owner's Engineer.

2.19. NOT USED

2.20. LIGHTING FIXTURES

Lighting fixtures shall be as shown on the fixture schedule. Lamps shall be manufactured by CROUSE HINDS, Sylvania, Philips, or a product of equal construction specifically approved by the Owner's Engineer. Where indicate on drawings, LED lighting fixtures suitable for multi voltage shall be used.

2.21. TERMINAL BLOCKS

Terminal blocks shall be Allen-Bradley Bulletin 1492-F1 or Square D Company channel mounted, Type KBA-1 for 300 volts and less and Allen-Bradley Bulletin 1492-CA1 or Square D Company Type KCA-1 for 600 volts, or a product of equal construction specifically approved by the Owner's Engineer.

2.22. NOT USED

2.23. LIGHTNING PROTECTION EQUIPMENT (When Specified)

Air terminals for lightning protection shall be as specified on the drawings. Cable for connecting air terminals together and/or to grounded metal shall be as specified by an accredited lightning protection vendor. Ground pigtails are included in the grounding design for connection to lightning protection devices.

2.24. Not used

2.25. Not used

2.26. Not used

2.27. EQUIPMENT NAMEPLATES

2.27.1. All electrical equipment, device or enclosure shall be properly identified with a

nameplate, plastic marker or other suitable means as approved by the Owner's Engineer. Nameplates shall be laminated plastic with white backgrounds engraved to expose a black core.

2.27.2. Generally, large pieces of equipment will be provided with engraved nameplates, and details are provided for nameplates at pushbuttons and other local devices. It shall be the responsibility of the contractor to provide identification for all other electrical equipment, device or enclosure not furnished with readily noticeable tag, nameplate or other means of identification.

2.27.3. Nameplates shall be provided for all motors. Nameplates shall provide the driven equipment description, i.e., "Slushing Chest Pump," the equipment or motor number, the motor control center (MCC) number with compartment number. Nameplates will normally be mounted adjacent to the motor.

2.27.4. All cable trays shall be identified at the time of installation with the alphanumeric number shown on the plan drawings. This cable tray identifier shall be painted or installed on the outside rail with 4-inch high characters. Characters shall be colored black on a painted white background at least 6 inches long. The tray identifier shall be installed at each point where the tray designation changes and at 50-foot intervals in between. Cable trays with cables over 600 V shall have warning markings per NEC 392.18(H).

2.27.5. Small devices such as limit switches, solenoids or photoelectric cells shall identify the device tag number by small plastic tags fastened to the outside of the device with plastic band or stainless steel wire.

2.27.6. Large junction boxes, pull boxes or similar enclosures shall be identified as shown on the drawings with painted letters and/or numbers which shall be readily seen from floor level. These letters and numbers shall be minimum 2½ inches high and the color paint shall be in contrast to the color of the box or enclosure. In addition, these letters and/or numbers shall be painted on the inside of the box and on the door or cover.

2.27.7. Control panels, relay panels or enclosures with electrical devices mounted inside or on the outside of the enclosure shall have a large nameplate (3 inches by 5 inches) indicating the purpose of the cabinet and smaller nameplates (1 inch by 3 inches) describing the use or action of the device mounted on or inside the enclosure.

2.27.8. Circuit breaker panelboards (i.e., lighting, instrument or receptacle panels) shall have a nameplate installed on the outside and inside of the door. This nameplate shall state the panelboard name and the location of the circuit breaker feeding the panel MCC tag number and compartment and the drawing number on which the panelboard schedule shows.

2.27.9. All transformers shall have a nameplate installed on the front cover which states the transformer service equipment number or identification number, the panelboard or device served, and the location of the circuit breaker feeding the transformer MCC tag number and compartment, and the drawing number on which the transformer schematic shows.

2.27.10. Equipment such as motor starters, safety switches, welding receptacles and circuit breakers shall be furnished with 1 inch by 3 inches plastic nameplates stating description of item served and the MCC tag number with compartment number (which feeds the equipment), if applicable.

2.27.11. Panelboard directories shall be filled in with a typewriter and properly inserted inside the correct panelboard door.

2.27.12. Miscellaneous items not covered above or items that are not suitable to standard methods because of location, shape, size, etc., shall be identified as approved by the Owner's Engineer.

2.27.13. For reused equipment supplied by the Owner, the contractor shall remove all nameplates that are not relevant or have changed.

2.28. FUSES

Prior to acceptance testing of any equipment, the contractor shall inspect all fuses for that equipment and ensure that all fuse holders have the proper size fuse and that all fuses are in proper working condition. Any blown or otherwise defective fuse shall be replaced. The contractor shall furnish one extra fuse for each size and type fuse used on the project (for equipment which the contractor furnished).

2.29. ROTATING EQUIPMENT

2.29.1. The contractor will be responsible to electrically connecting and bumping the motors for proper rotation. Motors shall be connected to the ground system as shown elsewhere in these specifications. Unless otherwise noted or detailed on the drawings, flexible metal conduit shall enter the side or bottom of motor conduit boxes and shall be so installed that liquids will tend to run off the surface rather than toward the motor fitting.

2.29.2. All motors must be "Meggered" when received, when removed from storage and during checkout. All three readings should appear on a tag attached to the motor. Refer to Section 4.2 for Insulation Tests.

2.29.3. The contractor shall make all electrical connections to motors and other rotating equipment as specified herein and as shown on applicable drawings. The contractor shall verify that the proper overload heaters are installed, based upon motor

nameplate full load current. One spare overload heater for every size and type used shall be provided. All motors shall be tested for proper direction of rotation and necessary reconnections made. Unless specifically approved, motors shall be checked for rotation with the coupling removed. Any motor found to be operating incorrectly shall be checked to determine the cause and the conditions corrected to the satisfaction of the Owner's representative or Owner. Permission shall be obtained from the Owner's representative or Owner before starting any motor for a test.

2.29.4. An electrical equipment tag shall be completed for each motor indicating the following information and signed by the contractor and the resident electrical Owner's Engineer:

- equipment description
- service location number
- equipment number
- megger test results
- installation complete
- checkout complete

2.29.5. The contractor shall assure that each motor has a metal tag on it with the equipment identification number.

2.30. MOUNTING HEIGHTS

Unless otherwise noted, mounting heights from finished floor to centerline of electrical equipment shall be as follows:

Device	Mounting Heights
Selector Switches	4 ft. - 6 in.
Pushbutton Stations	4 ft. - 6 in.
Convenience Outlets (Plant)	3 ft. - 6 in.
Convenience Outlets (Office)	1 ft. - 6 in.
Toggle (Lighting) Switches	4 ft. - 6 in.

Device	Mounting Heights
Lighting Panelboards (To Top)	6 ft. - 0 in.
Circuit Breakers (To Top)	6 ft. - 0 in.

2.31. SITE CLEARING AND DEMOLITION

2.31.1. When specified, the contractor shall be responsible for site clearing of various items as called out on the drawings. In some cases, these items shall be relocated and will be so noted. Other items will require demolition and will not be relocated. All electrical devices removed shall be turned over to the Owner.

2.31.2. Prior to disconnecting of any wires for demolition, the contractor shall locate the power source (i.e., disconnect switch, motor starter, etc.). Devices removed from service shall have all power conductors grounded at both ends (motor and starter, etc.). Both ends of the conductors shall have an information tag installed advising who disconnected the device, the date, and the reason (and where the unit was fed from for field end of cable).

2.31.3. In no case shall the contractor cut wires that have no proper identification.

3. INSTALLATION

3.1. RACEWAY INSTALLATION

3.1.1 General. Conduit runs are to be so installed that they are mechanically secure, electrically continuous, and neat in appearance. The interiors of conduit shall provide clean, smooth raceways through which conductors may be drawn without damage to the insulation. All threaded connections shall be wrench-tight.

3.1.1.1. Unless otherwise noted or required, all raceways shall be of rigid aluminum conduit above ground and PVC underground. The minimum size raceway shall be ¾ inch trade size, except that ½ inch conduit may be used for lighting fixture stems.

3.1.1.2. Conduit shall not be stored directly on the ground or in any other place where dirt is likely to enter it. After conduit is installed and before the wires are drawn in, its ends shall be plugged, capped or protected in some other way against the intrusion of foreign matter.

3.1.1.3. Should any raceways become clogged through the neglect of the contractor to protect them, they shall be replaced by the contractor without additional expense to the Owner.

3.1.1.4. Conduit shall be cut off square with a power saw or a rotary type conduit cutter designed to leave a flat conduit face. Pipe cutters shall not be used for cutting conduit. The cut ends of conduit shall be reamed with a reamer, designed for the purpose to eliminate all rough edges. Threads shall be cut with standard conduit dies providing ¾-inch taper per foot and shall be of the proper length so that joints and terminals may be made up tight and the ends of the conduit not deformed. Dies shall be kept sharp and a good quality threading oil used continuously during the threading operation. Metal cuttings and oil shall be removed from the conduit ends after the threads are cut and threads shall be painted before connections are made. Zinc-rich epoxy primer shall be used on the threads of steel conduit. A lubricant recommended by the conduit manufacturer and approved by the Owner's Engineer shall be applied to aluminum conduit threads.

3.1.1.5. Strap wrenches only shall be used to tighten joints in plastic coated rigid steel conduit. All damage to the plastic coating, such as cuts, nicks and threader chuck jaw marks, shall be carefully repaired using the conduit manufacturer's recommended patching material. A solvent, or the same patching material, shall be used to seal around the edges of conduit fitting covers.

3.1.1.6. All bends in conduit 1½ inches and smaller may be made in the field using manual or power tools designed for the purpose, except PVC coated conduit systems shall utilize manufactured elbows. Right angle bends in conduit sizes 2 inches and larger shall be made with manufactured elbows. Changes in direction of conduit shall be made in elbows or fittings, if the conductors are smaller than No. 1 AWG. Pull boxes shall not be used unless specifically designated otherwise. Concentric bends shall not be used in place of elbows in grouped conduit runs.

3.1.1.7. The Owner or Owner's representative may require the contractor to remove conduit unions if, in his opinion, their use could have been avoided by proper layout and planning of the installation. Such removal shall be at the contractor's expense.

3.1.1.8. Trapped runs of conduit shall be avoided, if possible. When they are necessary, they shall be drained using a "tee" condulet equipped with a drain, Crouse-Hinds ECD 15 or a product of equal construction specifically approved by the Owner's Engineer. Conduit passing through areas where there is likely to be a temperature differential of 20°F or more shall be sealed with a proper seal fitting at the wall or barrier between such areas.

3.1.1.9. All conduit crossing building or structure expansion joints shall be fitted with approved expansion fittings, except that fittings will not be required when conduit crossing an expansion joint is supported on trapeze hangers in such a way that at no time will the conduit be under stress due to building expansion or contraction. Bonding jumpers shall be installed around all expansion joint fittings.

3.1.1.10. All conduit terminating in sheet metal boxes where no threaded hubs are provided shall be fitted with double locknuts and bushings. Sheet metal enclosures located in wet process areas shall be furnished with threaded hubs or Myers “Scru-tite” hubs. Flexible metallic conduit shall be provided where called for on the drawings; where necessary to allow for movement; or to localize sound or vibration, at transformers, at motors and any other rotating equipment.

3.1.1.11. Conduit routing, where not detailed and/or dimensioned on the drawings, shall be determined in the field by the contractor. Final and exact routing of conduit even when dimensioned on the drawings shall be determined by a field check of the proposed conduit routing before installation of the run is started. Any obstacles encountered or conflicts with the work of other trades shall be brought to the Owner’s Engineer attention so that he may determine the exact routing to be followed. Exposed conduit shall be run perpendicular or parallel to the main structural components of the building. Concealed conduit shall follow the most direct practical route from outlet to outlet, unless specifically indicated otherwise on the drawings.

3.1.1.12. Curbed openings through floors and openings through walls for the passage of banks or raceways and sleeves through floors for the passage of single raceways will usually be shown on the Architectural and Structural drawings and furnished under other sections of the specifications. When necessary to cut through walls, floors, or roofs for raceways, the work shall be neat and the contractor shall repair any damage to the building using material equal to that originally used and labor skilled in the trades involved. Holes shall not be cut or burned through structural members unless approved in writing by the Owner’s Engineer.

3.1.1.13. A polyproplyene pull cord shall be left in each telephone conduit to facilitate the future installation of conductors by others.

3.1.1.14. The contractor shall seal all openings or holes where conduits pass through walls or floors. When passing through a fire wall or floor, the seal shall be fire rated per the drawing details.

3.1.2 *Underfloor Conduit Installation*. The installation of conduit in slabs and under slabs on grade is to be avoided whenever possible and shall only be made when specifically required by the drawings or with written approval of the Owner’s Engineer.

3.1.2.1. Only PVC conduits may be installed in concrete or underground. Conduits installed in slabs shall occupy the middle third of the slab and shall have a space not less than 3 times the nominal diameter of the larger conduit between parallel runs of conduit.

3.1.2.2. Conduits turning up from a concrete slab shall terminate in couplings, with their top ends set 2 inches above the concrete or as indicated on drawings. Where they turn up into permanent walls or partitions, the couplings may be omitted and the conduit

runs need not be interrupted at floor level. A stick of conduit shall be screwed into each coupling and maintained in the vertical position until the concrete has hardened. After the concrete has set, they shall be removed and the couplings plugged with screw type pipe plugs. When the concrete surface is likely to be wet, steel conduit shall be protected at the slab surface and for at least 2 inches above by heavy application of a gray or aluminum color paint, GE Glytal, or a product of equal construction specifically approved by the Owner's Engineer.

3.1.3 *Raceway Supports*. Parallel runs of conduit may be supported by structural steel racks or prefabricated structural systems. When two or more racks are arranged one above the other, vertical separation of not less than 12 inches shall be provided between racks, unless otherwise indicated on the drawings. The spacings of conduits on the racks shall be at least enough to provide 3-inch clearance between locknuts on adjacent conduits at terminations and to allow room for fittings.

3.1.3.1. All miscellaneous iron used for conduit racks, all hanger rods, conduit clamps, beam clamps, nuts, bolts, etc. shall be galvanized. Where it is necessary to cut or drill galvanized metal, it shall be given one zinc-rich epoxy primer coat before installation. After installation, an additional primer coat and one finish coat of aluminum paint shall be applied over the area of the cut. Welds made in the field shall be thoroughly cleaned and then given three coats of paint as described above.

3.1.3.2. The contractor may use prefabricated structural systems such as Kindorf, Powerstrut, Unistrut, or a product of equal construction specifically approved by the Owner's Engineer, for support of raceways.

3.1.3.3. The contractor shall be fully responsible for the proper sizing and assembling of support systems to adequately and rigidly support raceways and/or equipment mounted thereon with a safety factor of at least three.

3.1.3.4. Conduit racks shall be filled to not more than 75% of their capacity by the conduit shown on the contract documents. The intent is to have usable space available for future conduit. To ensure this, conduits leaving the rack horizontally shall be offset up or down so that future conduits may be installed in the space remaining. Conduit racks shall be constructed to permit access for wire or cable pulling at all pull points, even when future conduits are added to fill the racks.

3.1.3.5. Where conduit racks are supported on rods from beam clamps or by some other non-rigid suspension system, rigid supports shall be installed at not more than 50 foot intervals to give lateral stability to the rack.

3.1.3.6. Conduit racks or hangers must in no way interfere with machinery, piping, structural members, process equipment, process access of anticipated future equipment, etc. The contractor shall refer to architectural, structural, equipment layout and piping drawings to insure that this requirement is met. All high voltage conduit shall be

labeled with the circuit phase-to-phase voltage by means of a firmly attached tag or label of approved design at each conduit termination, on each side of all walls or barriers pierced and at intervals not exceeding 50 feet along the entire length of the conduit.

3.1.3.7. Conduit sizes two inches and larger shall be supported at spacings not exceeding 10 feet and conduit sizes 1½ inches and smaller shall be supported at spacings not exceeding 8 feet.

3.1.3.8. The means of fastening conduit to supports shall be by one hole malleable iron conduit straps secured by wood screws to wood, by bolts or power driven studs to steel and by bolts with expansion anchors to concrete or masonry; by “Korn” clamps, by U-bolts, or a product of equal construction specifically approved by the Owner’s Engineer. “Clamp backs” shall be used when strapping conduits to walls, column faces, or other such surfaces.

3.1.3.9. Pliers, channel-lock or otherwise, shall not be used to tighten nuts, bolts or screws. All nuts bearing on metal shall be locknuts or have lock-washers.

3.1.4 *Underground Duct Installation*. Details, including locations, for duct bank and manhole construction are given on the drawings.

3.1.4.1. Refer to Structural Owner’s Engineering Construction Specification section, “Installation of Underground Utilities” for concrete, reinforcing and placement specifications.

3.1.4.2. Long-radius elbows of galvanized rigid steel conduit shall be used where ducts turn up and leave the concrete encasement. These elbows shall be coated with zinc-rich epoxy primer for at least 2 inches above and 6 inches below the concrete surface.

3.1.4.3. When the installation is complete, each duct shall be brushed and swabbed out and a mandrel then pulled through to demonstrate that it is free of obstructions. The mandrel shall be approximately 3 inches less in diameter than the duct I.D.

3.1.5. Raceway installation on metal grating. Under no circumstances shall cable raceway or conduit be installed directly on top of platform grating causing a tripping hazard.

3.2. CABLE TRAY INSTALLATION

3.2.1 The contractor shall furnish and install all cable tray supports and miscellaneous fittings required. Cable trays and their fittings shall be constructed, installed and supported in accordance with NEMA Standards Publications VE-2 for metal cable trays or FG-1 for fiberglass trays. When cable trays are installed one above the other, the bend radius of all trays so installed shall be the same.

3.2.2 When it is necessary to cut out a rung to facilitate cable dropouts, all edges shall be

filed smooth and rounded. The contractor shall make miter joints in tray when manufactured fittings will not satisfy field requirements. Ventilated channels in 4-inch widths or conduit shall be used for supporting cables dropping out of trays to connect to individual pieces of equipment.

3.2.3 Unless otherwise noted, all cable trays shall be supported by rigid steel brackets, trapeze type hangers or fittings made by the tray manufacturer. All hanger materials, including threaded hanger rods, all brackets and other structural support items shall be of hot dipped galvanized steel and shall have sufficient strength to support the load with a safety factor of at least three when all trays are filled to design capacity. All field cuts and welds shall be thoroughly cleaned; given two primer coats, each of a different color, and a finish coat of aluminum paint. In fabricating or installing cable tray supports, all holes shall be drilled and all cuts made with a saw. All hanger rods shall be of 2 inches or larger diameter; shall be double-nutted at the lowest cable tray support; and shall not be spliced. Except with specific approval, or where otherwise noted on the drawings, cable tray support spacing for horizontal runs shall not exceed 8 feet for ladder and channel type trays. For vertical runs, supports shall be not more than 8 feet apart for either tray or channel. Cable trays installed on trapeze type hangers shall be braced laterally at intervals not exceeding 50 feet for ladder type tray and 25 feet for 3 and 4 inch channel tray.

3.2.4 The contractor may use prefabricated structural systems such as Kindorf, Unistrut, or a product of equal construction specifically approved by the Owner's Engineer, for support of cable tray and channels.

3.2.5 Aluminum cable tray installed in heated areas shall have expansion joint splice plates installed at intervals not exceeding 144 feet on all straight runs, and when installed in non-heated areas at intervals not exceeding 72 feet. Steel cable tray shall have expansion joint splice plates installed at intervals not exceeding 288 feet on straight runs installed in heated areas and at intervals not exceeding 146 feet in non-heated areas. The gap set between cable tray lengths at expansion joint fittings shall relate to the maximum and minimum gap possible as the temperature at the time of installation relates to the temperature extremes for that area. All expansion joints shall incorporate an approved bonding jumper to maintain electrical continuity. An approved lubricant shall be used on the sliding surfaces of expansion joints.

3.2.6 The contractor shall seal all openings where tray passes through walls or floors. When passing through a fire wall or floor, the seal shall be fire rated per the drawing details.

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3.2.7 The Contractor shall install solid covers on all outdoor cable tray. If the cable tray has multiple levels, only the topmost tray needs to be covered. If there is a possibility of an object falling from above and damaging the cables in a tray, a solid cover shall be installed to protect the cables in that tray.

3.3. WIRE AND CABLE INSTALLATION

3.3.1 *Cable Installation, General*. Connectors and terminal lugs for all sizes of conductors may be of the crimp-on type, provided that the connectors and lugs and the tools for their installation are approved by the Owner's Engineer. Hydraulic and ratchet type tools for compressing lugs or connectors shall be built to require full closure of the dies before the tool can be reopened. Crimp-on connectors and terminators for cables larger than No. 3/0 AWG shall be long barrel with two hole tongues. For conductor sizes No. l4, No. 12, and No. 10 AWG in lighting service, splices and taps may be made with MMM "Hyflex" connectors, or a product of equal construction specifically approved by the Owner's Engineer. Other splices and taps in 600 volt conductors sizes through No. 2/0 AWG may be made with "Split-Bolt" connectors and insulated with heat shrinkable insulation as manufactured by Raychem, Sigmaform, or a product of equal construction specifically approved by the Owner's Engineer. With 600 volt conductors larger than No. 2/0 AWG , splices and taps may be made with Burndy type KVS connectors, or a product of equal construction specifically approved by the Owner's Engineer. These splices and taps shall also be insulated with heat shrinkable insulation as manufactured by Raychem, Sigmaform, or a product of equal construction specifically approved by the Owner's Engineer. Control conductors shall be connected directly to terminal strips. Splices and taps in cables operating at more than 600 volts will be permitted only with the approval of the Owner or Owner's representative. Splices and taps, if approved, and terminals in high-voltage cables shall be made with long-barrel compression type fittings as made by Burndy Corporation, or a product of equal construction specifically approved by the Owner's Engineer. Installation shall be in strict accordance with the cable manufacturer's recommendations. Stress relief cones shall be used at the terminations of all shielded medium-voltage cables. All power cable ends shall be sealed to exclude moisture from the strands.

3.3.1.1 All terminations, stress relief cones, and other insulation seals for cables shall be heat shrinkable products by Raychem, Sigmaform, or a product of equal construction specifically approved by the Owner's Engineer.

3.3.1.2 Connections in motor terminal boxes, where the motor leads are furnished with crimped-on lugs, shall be made by installing lugs on the motor branch circuit ends and then bolting the proper pairs of lugs together. Motor connection kits as manufactured by Raychem, Sigmaform, or a product of equal construction specifically approved by the Owner's Engineer, shall be used to insulate the connections.

3.3.1.3 Connections to high voltage switches, switchgear, and buswork are to be made using silicon bronze bolts, flatwashers, and Belleville washers and shall be torqued as shown below:

Bolt Size	Torque
¼ in. - 20	5 ft-lb
5/8 in. - 18	10 ft-lb
3/8 in. - 16	15 ft-lb
7/16 in. - 14	30 ft-lb
½ in. - 13	40 ft-lb
5/8 in. - 11	55 ft-lb

3.3.1.4 When spare conductors are called for, the free lengths shall be neatly coiled and tied where they emerge from the conduit or cable termination fittings and tagged “spare.” Free lengths shall be long enough to reach any terminal in the enclosure they enter, except that in motor control centers they need not be more than 10 feet in length.

3.3.2 *Single Conductor Cable Installation*. Single conductor wire and cable shall be installed in conduit or other approved raceways. Conductors shall be pulled into raceways with great care to prevent abrasions, kinks or other damage. Lubricants used for conductor pulling shall not be harmful to the conductor insulation and shall be approved by the Owner’s Engineer for such use. When drawing conductors into aluminum conduit, heavy pulls shall be made with polypropylene rope or other approved line to avoid cutting into elbows. Sufficient slack shall be provided in all junction boxes or other points of termination to permit splicing and taps for both immediate and future needs. Conductors in vertical raceways shall be supported at distances not exceeding those recommended in the current edition of the National Electrical Code.

3.3.2.1 All control power, lighting and convenience outlet circuits shall be color coded throughout their entire lengths. When any outlet or junction box contains more than one conductor with the same phase color coding, each conductor shall be labeled with its circuit number by means of plastic sleeve type markers.

3.3.2.2 All control conductors will be numbered on the drawings and shall be labeled at each termination with this number, using plastic sleeve type markers designed for the application. Junction boxes for the interchanging of conductors between conduits are to be avoided and shall not be used unless specifically called for on the drawings. In large junction boxes, such as those above or below motor control centers and large wiring gutters, the conductors from each conduit shall be bound

together to give a neat appearance and to facilitate any future rework. Power and control wiring shall be run in separate conduits, unless otherwise specifically indicated on the drawings. When conduits terminate in a junction box, wiring gutter or piece of equipment, all conductors and each conduit shall be labeled. Conduits shall be identified by using Thomas and Betts Corporation “Ty-Rap” identification tags, or a product of equal construction specifically approved by the Owner’s Engineer. Metal tags and tags with metal rims will not be permitted in any enclosure.

3.3.3 *Multiconductor Cable Installation*. Most power and control cables will be installed in cable trays, unless otherwise shown on the drawings. When cables leave trays, they shall be protected between the trays and the cable terminus points by drawing them through conduits, or by installing them in ventilated channels.

3.3.3.1 It shall be the contractor's responsibility to accurately measure all cable runs before the cable is cut. The contractor will be held responsible for all losses resulting from his failure to do so. The contractor shall furnish all tools and equipment; use sufficient properly trained personnel; and exercise necessary care to ensure that the cable is not damaged during installation. Any cable damaged because the contractor did not comply with these requirements shall be removed and replaced by the contractor without further expense to the Owner. Cable found to be damaged before installation shall not be installed without written permission from the Owner or Owner’s representative.

3.3.3.2 Generally, cables shall enter and leave trays, as shown on the detail drawings, to prevent liquids from collecting inside the conduit dropouts. Care shall be exercised with cables entering or leaving cable trays, that all cable bend radii exceed the recommended minimums and that cables are not left to rest unprotected on any sharp edge or corner.

3.3.3.3 When spacing is to be maintained between cables in trays, they shall be fastened to the trays with suitable bands or straps at intervals not greater than 7½ feet on horizontal runs and 4½ feet on vertical runs. All cable in trays where spacing is not maintained shall be attached at points 6 inches from the end of the fitting to each elbow or tee and at intervals not exceeding 4½ feet in all tray runs in other than a horizontal plane. Bands or strips, shall be plastic, and of a type not adversely affected by sunlight.

3.3.3.4 Cables connecting stationary pieces of electrical equipment shall be rigidly supported over its entire length. Cable connecting to equipment subject to vibration, such as transformers, motors, etc., shall have not less than 18 inches or more than 36 inches of cable left free at each such termination, unless additional length is required because of the minimum bending radius of the cable.

3.3.3.5 PVC insulated or jacketed cables shall not be installed or worked in any way at

temperatures below 14°F.

3.3.3.6 Each cable entering an enclosure shall have its conductors bundled together and identified with the cable number using a Thomas and Betts Corporation identification type “Ty-Rap,” or a product of equal construction specifically approved by the Owner’s Engineer. All groups of conductors within an enclosure shall be shaped and formed to provide a neat appearance and to facilitate future additions or rework. All control conductors shall be numbered and shall be labeled at each termination with this number, using plastic sleeve type markers designed for the. Metal tags and tags with metal rims will not be permitted in any enclosure.

3.3.4 Shielded signal cable shall, unless specifically noted otherwise, be installed in cable tray or aluminum conduit. They shall not be spliced at any point and shall be terminated with compression type ring tongue terminals. The shields and drain wires of shielded signal cables shall be grounded only at one point, as indicated on the drawings. At the time of installation, shields shall be checked for accidental grounds.

3.3.5 The contractor shall furnish and install a suitable permanent plastic marker on each end of every multiconductor cable or conduit if single conductor wires are installed. This marker shall indicate the cable/conduit number as indicated on the drawings. Identification type “Ty-Rap” as manufactured by Thomas and Betts Corporation, or a product of equal construction specifically approved by the Owner’s Engineer shall be used.

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3.3.6 All electrical conduit and cable penetrations into hazardous areas shall use Roxtec frames, Roxtec seals and Roxtec accessories rated for the hazardous area. If the penetration is through a fire wall, the penetration shall meet the same fire retarding requirements as the firewall it is penetrating.

3.4. EQUIPMENT SUPPORTS

3.4.1 The contractor shall furnish and install all necessary supports for mounting electrical apparatus. Structural shapes, rods, bolts, nuts, etc., used to support electrical equipment shall be galvanized. Field cuts in galvanized material shall be given two zinc rich epoxy primer coats and a finish coat of aluminum paint.

3.4.2 The contractor may, with the approval of the Owner’s Engineer, use prefabricated structural systems such as Kindorf, Unistrut, or a product of equal construction specifically approved by the Owner’s Engineer, for support of equipment.

3.4.3 The contractor shall, except where sizes are given on the drawings, be responsible for selecting bolts, shapes and other items to support apparatus and equipment with a minimum safety factor of four. He shall take care that he does not weaken or overload any part of the building or other structures and shall not drill or burn structural members without the prior approval of the Owner’s Engineer or Owner or

Owner's representative.

3.4.4 Fastenings to steel may be welded or by beam clamps or velocity driven studs; to concrete or solid masonry by bolts with expansion shields or inserts; and to hollow tile or block masonry by toggle bolts. Lock washers shall be used under all nuts bearing on metal.

3.5. NOT USED

3.6. GROUNDING

3.6.1 Building, tanks, electrical distribution equipment, switchgear, motor controller centers, control panels, bench-boards, large motors, drives, computers, and other structures and equipment shall be grounded as indicated on the drawings. Where ground rods are required, the rods shall be 10 feet long or otherwise as noted on drawings. Rods shall be driven vertically, and the top of the rods shall be a minimum of 30 inches below finished grade.

3.6.2 Ladder type cable trays, separately derived systems and all medium-voltage motor frames shall be connected to the grounding electrode system. The frames of all motors, two-wire control devices, disconnect switches, lighting transformers, panelboards, and the enclosures of other electrical apparatus shall be grounded through an equipment grounding conductor run with the power supply or control circuit conductors. Local pushbutton and selector switch stations with nonmetallic enclosures shall be grounded as shown on the installation detail sheets. At expansion joints, adjoining ends of cable trays shall be bonded with jumpers of appropriate size and material, i.e., copper for steel trays and aluminum for aluminum tray.

3.6.3 All aluminum power cable trays shall have a continuous 4/0AWG green PVC jacketed copper cable installed and connected to the cable tray system. The green jacket shall be stripped to bond the cable to the cable tray using tin plated cast copper alloy ground clamp (Burndy type GC-CT or equal). 4/0AWG bare copper cable can be used on steel cable trays. If bare cables is used on aluminum cable trays, make sure that the copper conductor is not touching the cable tray.

3.6.4 Messengers supporting cables shall be bonded at each end to the cable trays or raceways in which the cable runs are continued.

3.6.5 The ground wires in power cable assemblies shall be connected at each terminal point to a ground bus, if available, or to the equipment enclosure. These ground wires shall not be carried through "doughnut" CTs used for ground fault relaying, but ground leads from stress cones shall be. Cable armor shall be grounded at each end.

3.6.6 Care shall be taken to avoid grounding the insulated bearing pedestals of large motors.

3.6.7 The neutrals of the 2.4, 4.16, and 15 kV systems shall be grounded through resistors as shown on the drawings. The neutrals of the 480 V systems shall be grounded as shown on the drawings. The cable between the transformer neutral bushing and the neutral grounding resistor shall be insulated for line-to-line voltage of the system.

3.6.8 In making grounding connections, the areas which are to be in contact shall be cleaned of all paint, rust, grease, dirt, etc., to ensure good conductivity.

3.6.9 All exothermic process welded connections and uninsulated segments of ground conductors below grade shall be painted with a bitumastic compound to prevent corrosion.

3.6.10 Where a grounding conductor is installed in a ferrous conduit, both ends of the conduit shall be bonded to the grounding conductor.

3.6.11 Where the wiring for lighting systems consists of single conductor cables in conduit, each conduit shall contain an equipment grounding conductor. The grounding conductor shall have GREEN colored insulation and shall be used to ground equipment in the lighting system. Where the wiring for lighting systems consists of multiconductor cables, the equipment grounding conductor(s) in the cables shall be used to ground equipment in the lighting system.

3.7. LIGHTING

3.7.1 The contractor shall furnish and install a complete lighting system including fixtures and supports and all wiring.

3.7.2 Fixtures shall be installed as near as possible to the locations shown on the drawings. The contractor shall study the work of all trades and select fixture locations that avoid interference with other work and that result in symmetrical layouts.

3.7.3 The contractor shall furnish and install all lamps. At the conclusion of the work, regardless of what lamps have been used during its course, he shall leave each fixture properly lamped.

3.8. NOT USED

3.9. LIGHTNING PROTECTION INSTALLATION

Lightning protection installations shall be made in accordance with Underwriters' Laboratories, Inc. "Installation Requirements" and NFPA 780.

3.10. COMMUNICATIONS SYSTEM

3.10.1 Page/Party Voice Communication System

Page/party voice communication system will be furnished and supplied based on a Gai-tronics system devices that will provide public address, paging, and general alarm capabilities.

3.10.2 Fire Detection and Alarm System

Fire detection and alarm systems shall be furnished and installed based on the following:

- Office Areas - Manual fire and smoke detection with audio/visual alarm.
- Control Rooms - Manual fire and smoke detection with audio/visual alarm.
- Electric Rooms - Manual fire and smoke detection with audio/visual alarm.
- General Building – Manual fire detection with audio/visual alarm.
- Bathroom/Locker Rooms – Smoke detection with audio/visual alarm.

The communication and fire detection cable between these units shall be run in rigid aluminum conduit.

3.11. VOLTAGE ADJUSTMENT

Unless otherwise noted, the tap position on all transformers shall be selected and set so that under full load conditions the output voltage is as near as possible to the nameplate rating of supplied equipment.

4. INSPECTION, TESTING AND START-UP

The intent of the inspection, testing, and checkout work specified herein, or required, is to ensure that all electrical workmanship and equipment, whether Owner furnished or Contractor furnished, is installed and performs in accordance with the design specifications, drawings, manufacturer's instructions and all applicable codes and requirements. Also, it is intended to provide, ensure, or determine the following:

- If the equipment or installation has been subjected to damage during shipment or installation,
- If the equipment is in accordance with the Purchase Orders and specifications,
- Provide initial acceptance tests and recorded data that can be used as a bench mark for future routine maintenance and trouble shooting by plant’s operating forces,

- Ensure a successful start-up with a minimum of last minute interruptions and problems,
- Determine the suitability of the equipment and systems for energization and placing into operating service,
- Provide assurance that each system component is not only installed satisfactorily but performs, and will continue to perform, its function in the system with reasonable reliability throughout the life of the plant,
- Contractor Responsibility. The Contractor shall provide all necessary supervision and labor, materials, tools, test instruments or other equipment or services and expenses required to inspect, test, adjust, set, calibrate, functionally and operationally check all work and components of the various electrical systems and circuitry throughout the installation. Also, the Contractor shall include the furnishing of sufficient personnel to assist operating forces in any additional checks they may require for acceptance, start-up, run-in and placing the equipment and systems into continuous service,
- Listings and Descriptions of Work. The listings and descriptions of the inspections, tests and checks described herein shall not be considered as complete and all inclusive. Additional normal standard construction (and sometimes repetitive) checks and tests will be necessary throughout the job, prior to final acceptance by the Owner.

4.1. INSPECTION AND OTHER TESTS

4.1.1 Equipment purchased by the Contractor or purchased by the Owner for Contractor installation shall be inspected and tested to determine its condition. At any stage of construction and when observed, any electrical equipment or system determined to be damaged, faulty, or requiring repairs shall be reported to the Owner's representative. Corrective action may require prior approval.

4.1.2 Upon completion of the various phases of the project, or at convenient times during the progress of the work, wiring and equipment installed by the contractor shall be checked and tested as hereinafter specified. All tests shall be recorded and submitted to the Owner or Owner’s representative for review.

4.1.3 Inspection and test shall be performed to the satisfaction of the Owner or Owner’s representative. The Owner or Owner’s representative will coordinate the program, and may request additional tests if he deems necessary.

4.1.4 Under no circumstances shall any part of the installation be operated by construction personnel without prior approval of the Owner or Owner’s representative. This restriction includes the checking of electrical motors for proper rotation.

4.1.5 All equipment and instruments required to conduct the tests shall be provided by the contractor. This test equipment shall have calibrations traceable to the National Bureau of Standards. Contractor dated calibration labels shall be visible on all test equipment. Calibrations over 6 months old shall not be acceptable on field test instruments. All testing instruments shall be checked to insure satisfactory operation prior to proceeding with the tests. Serial and model numbers of the instruments used shall be recorded on the test forms.

4.1.6 All testing and checkout work shall be performed with fully qualified personnel skilled in the particular tests being conducted. This is essential for obtaining and properly evaluating data while the tests are in progress and for insuring that important facts and questionable data are reported.

4.1.7 The Contractor shall ensure that all testing and checkout work is conducted in a safe manner. Special safety precautions such as the following shall be utilized where appropriate: (1) locking and tagging procedures; (2) barricades; (3) de-energization and/or isolation of equipment prior to testing; (4) review of procedures with the Owner's safety personnel; (5) erection of warning signs; 6) stationing of guards and watchmen; (7) maintenance of voice communications; and (8) personnel orientation.

4.1.8 Upon receipt of written notice from the contractor that the work has been completed, including all tests as herein specified, the Owner or Owner’s representative will give the entire work a thorough inspection. Any defects or omissions noted shall be corrected before acceptance of the work.

4.1.9 The checks and tests to be made shall include, but not be limited to, the following:

- Check continuity of all conductors and shields on shielded cables. Check for shield grounds,
- Visually check all wire and cable connections, including terminal wiring of switchgear, transformers and motor control centers,
- Make continuity checks of all power and control cables, including each conductor of multiconductor power and control cables,
- Check polarity of all bushing current transformers and instrument type current and potential transformers,
- Check current transformer ratios and continuity of the secondary circuits by passing current through the primary windings and taking readings of the primary current and of the current flowing through meter, relay and instrument coils in the secondary circuit,
- Check all ac and dc control circuits for short-circuits and extraneous grounds,

- Check all equipment for proper mechanical adjustment and freedom of operation, and remove all shipping blocks.
- Visually check all insulators for cracks or checking,
- Check adjustment and characteristics of all control and protective relays in accordance with manufacturer's instructions. Set and calibrate all relays or circuit protective devices in accordance with the system coordination requirements, and where applicable load test by approved means to assure proper calibration,
- Operate all electrically operated breakers, motor starters, contactors, etc., from their control devices.
- Check all closing, tripping, supervision and alarm functions of the control equipment.
- Trip each circuit breaker by operation of its associated protective relays.
- Check operation of all alarm circuits,
- Check voltage level on the buses and adjust no-load taps on all transformers in accordance with the directions of the Owner's Engineer,
- Check drive motors for proper rotation during pre-shutdown checkout in the drive aisle.

4.1.10 The Owner or Owner's representative shall be notified at least 48 hours before tests are performed, and he shall have the right to witness all tests.

4.1.11 The contractor shall furnish assistance, as required, to equipment vendor's representatives in the testing and adjustment of equipment furnished by their companies.

4.2. INSULATION TESTS

4.2.1 The contractor shall furnish the necessary test equipment and labor to test the insulation of electrical equipment and circuits before they are energized. A 500 volt "Megger", or other approved instrument, shall be used to test the insulation resistance of circuits insulated for 600 volts, 460 volt motors and transformers, low-voltage motor control centers and low-voltage switchgear. A 2500 volt "Megger", or other approved instrument, shall be used on medium-voltage motor controllers, high-voltage switchgear and transformers and 4160 volt motors. A high-voltage dc test set shall be used on 5 and 15 kV cable.

4.2.2 The insulation resistance of lighting and receptacle circuits and of control circuits need not be "Megged" but the circuits must be shown to be free of short-circuits and

unintentional grounds. The insulation to ground of each low-voltage feeder conductor shall be tested and must be at least 1 megohm. The phase-to-phase and phase-to-ground resistance of low-voltage switchgear and motor control centers must be at least 1 megohm before they may be energized.

4.2.3 The insulation resistance, in megohms, of motors shall be at least as great as the values given in the following table before they may be energized. The insulation resistance of the 480 volt and 2400 volt windings of dry type transformers must be at least equal to the values required for 460 volt and 2300 volt motors respectively.

4.2.4

Insulation Resistance in Megohms						
Winding	**Motor Terminal Voltage**					
Temperature	**230**	**460**	**500**	**575**	**230**	**400**
0°C	18.9	22.5	23.1	24.2	50.8	76.9
5°C	13.7	16.2	16.7	17.5	36.7	55.6
10°C	10.7	12.7	13.0	13.7	28.7	43.5
15°C	6.8	8.1	8.3	8.8	18.3	27.8
20°C	4.7	5.6	5.8	6.1	12.7	19.2
25°C	3.3	3.9	4.1	4.3	8.9	13.5
30°C	2.4	2.9	2.9	3.1	6.5	9.8
35°C	1.7	2.0	2.1	2.2	4.6	6.9
40°C	1.23	1.46	1.5	1.58	3.3	5.0

4.2.5 Low-voltage feeder insulation resistance may be tested with the connections to low-voltage switchgear and/or motor control centers made, in which case the resistance to ground and the resistance phase-to-phase must be at least 1 megohm. The resistance to ground of low-voltage motor branch circuits may be tested at the motor control centers with the motors connected, in which case the combined resistance to ground must be at least as high as the higher of the requirements for the separate parts.

4.2.6 Control power transformers, potential transformers and other devices connected phase-to-phase or phase-to-ground and any devices not designed to withstand the test voltages must be disconnected when testing insulation resistance in switchgear, motor control centers and other apparatus.

4.2.7 The insulation tests on cables rated 5 kV and higher shall be made after all splices and terminations are complete, but with equipment disconnected. The test equipment shall be the products of reputable manufacturers and shall be in good condition and calibration. The operator shall be trained and qualified in high-voltage dc cable testing and all reasonable precautions shall be taken to prevent injury to persons or property. Test voltages and procedures shall be as specified by the ICEA. All failures of high-voltage cables to meet test requirements shall be reported to the Owner or Owner's representative at once.

4.2.8 Test voltage shall be applied uniformly, not to exceed 1 kV per second or 75% of the rated current output of the test set (whichever is less). Record the micro-ampere leakage at equal steps of 5 kV. Allow 30 seconds stabilization time between steps

and leakage current measurements. When the maximum test voltage is reached, record the micro-ampere leakage current at 0, ¼, ½, ¾, 1 minute and each minute thereafter up to at least 3 minutes. This data shall be plotted while tests are in progress and testing may proceed if the curve remains relatively flat. If, as the test voltage is increased, the current starts to rise at a more rapid rate and a “knee” begins to be evident at the curve, the testing shall be stopped and the Owner shall be informed and decide the next course of action to be followed.

4.2.9 Maximum test voltages are as follows:

- 65 kV for 15 kV cable (133% insulation, No. 2 AWG and larger)
- 25 kV for 5 kV cable (No. 8 AWG and larger)

4.2.10 Test duration for shielded cables shall be 15 minutes maximum. Test duration for non-shielded cables shall be 5 minutes. The test voltage should be applied from phase to ground on each conductor with the other conductors, shields, and metallic jackets connected to ground.

4.2.11 A written record of all insulation tests shall be kept by the contractor on forms approved for the purpose and turned over to the Owner’s Engineer upon request, or at the termination of the work. These forms shall show the number or other suitable identification of each circuit or piece of apparatus tested, the date of the test, the temperature at the time the test was made, the instrument used, the test voltage applied, the resistance values found and the name of the person in charge of and witnessing the test.

4.3. GROUNDING

4.3.1 Visual inspection of all systems, raceway and equipment grounds shall be made to determine the adequacy and integrity of the grounding.

4.3.2 All ground testing results shall be properly recorded, witnessed, and reported to the Owner's Representative.

4.3.3 All main plant building loops and major equipment grounds shall be tested to remote earth or directly. System ground resistance for generating stations, switchyards and large substations shall not exceed one (1) ohm. System ground resistance for industrial plants, substations and buildings shall be in the range of two (2) to five (5) ohms and shall not exceed five (5) ohms.

4.4. START-UP

4.4.1 Prior to checkout by the Owner or Owner’s representative, the contractor shall check all his work and correct any faults discovered. The contractor shall have competent personnel available at all times to assist and to correct any faults found during the

Owner's checkout and start-up periods.

4.4.2 Wire used for temporary jumpers and test connections during checkout shall have insulation of a color obviously different from all other wire. All temporary jumpers shall be removed after the checkout is completed.

4.5. CONDUIT INSTALLATION QA/QC

All Conduits installed in ductbanks shall be quality checked for installation defects by the contractor who installed it. The Contractor shall have approval of the QA/QC procedure by the Owner and Owner's Engineer before starting installation. The records of the installation checks shall be turned over to Owner within a day of testing.

END OF DOCUMENT

Big Rivers
ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix G – Rev 2

Piping Specifications

(No updates to any documents since Rev 1 Package)

Appendix	Document Number	Document Title	Document Revision
G	143993-ASA-DE2-SPC-1200	PIPING SPECIFICATION	0

Piping Specification

Title:	**Table of Contents**		
Project Doc. No.:	**143993-ASA-DE2-SPC-1200**	Revision No.:	**0**

Project Name:	**FGD RETROFIT**	Project No.:	**245891**
Client:	**BIG RIVERS ELECTRIC CORP.**	Plant/Area No.:	**D. B. WILSON STATION**

Rev	Date	Issued For	Prepared	Checked	Approved	
A	05Mar21	Approval		CKF		
B	25Mar21	Bids		CKF	TCS	
C	15Apr21	Bids	FZ/SY	CKF	TCS	
D	18May21	Bids	FZ/SY	CKF	TCS	
0	20Jul21	Construction	FZ/SY	CKF	TCS	

The Identification Codes shown in (RED in Brackets) on the Service Index, Piping Material Specifications and Valve Specifications of this document are in accordance with Wood P&ID Legend Sheet 143993-03-100. These Identification Codes shall be used for the Pipeline List, Valve List and P&ID.

Wood equivalent Identification Codes shown in this document are used for Balance of Plant Piping Isometrics. (Material provided by Contractor)

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GENERAL PIPING SPECIFICATIONS

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SS-030-002	Codes and Standards	Rev 0 20Jul21
SS-030-010	Welding, General	Rev 0 07Dec18
SS-030-011	Welding of Carbon Steel	Rev 0 07Dec18
SS-030-013	Welding of Stainless Steel	Rev 0 07Dec18
SS-030-020	Fabrication and Installation - Carbon Steel	Rev 0 07Dec18
SS-030-021	Fabrication and Installation - Stainless Steel	Rev 0 07Dec18
SS-030-031	Examination, Cleaning and Testing	Rev 0 15Apr21

MATERIAL SPECIFICATIONS

Spec. No.	*Description*	*Revision*
SS-030-100	Piping Material Specification C2G (HBD) (JBD)	Rev 0 20Jul21
SS-030-100	Piping Material Specification F3A (HZD) (JZD)	Rev 0 20Jul21
SS-030-100	Piping Material Specification N2C (HAD) (JAD)	Rev 0 20Jul21
SS-030-100	Piping Material Specification P8P (H_G)	Rev 0 19Feb21
SS-030-100	Piping Material Specification P8X (H_D)	Rev 0 19Feb21
SS-030-100	Piping Material Specification P9A (HKG)	Rev 0 19Feb21
SS-030-100	Piping Material Specification S2K (HAD) (JAD)	Rev 0 19Feb21
SS-030-100	Piping Material Specification S4J (CID)	Rev 0 18May21
SS-030-100	Piping Material Specification S4K (HID)	Rev 0 19Feb21
SS-030-100	Piping Material Specification S6T (CID)	Rev 0 19Feb21

VALVE SPECIFICATIONS

Spec. No.	*Description*	*Revision*
SS-030-111	Valve Identification	Rev 0 20Jul21
SS-030-112	Valve Specifications – 14AF (G41N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 14CS (G43S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 17AS (G71S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 24AF (L41N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 24CS (L43S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 27AF (L71N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 27AS (L71S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 27ER (L75X)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 32GF (C21N)	Rev 0 19Feb21

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SS-030-112	Valve Specifications – 34CS (C43S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 37AF (C71N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 37AS (C71S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 37ER (C75X)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 37NSFA (C71W)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 38GF (C81N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 41BA (K21V)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 41BF (K21N)	Rev 0 15Apr21
SS-030-112	Valve Specifications – 51AF (P11N)	Rev 0 07Apr21
SS-030-112	Valve Specifications – 58AF (P81N)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 64AF (B41N)	Rev 0 07Apr21
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SS-030-112	Valve Specifications – 64HST (B43ST)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 67ER (B75X)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 67HS (B73S)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 67HST (B73ST)	Rev 0 19Feb21
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SS-030-112	Valve Specifications – 68GF (B81N)	Rev 0 19Feb21
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SS-030-112	Valve Specifications – 78AA (F81V)	Rev 0 19Feb21
SS-030-112	Valve Specifications – 98AF (H21N)	Rev 0 19Feb21

PIPING DETAILS

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TD-030-001	External Seal Water for End Suction Pumps	Rev 0 15May20
TD-030-002	Seal Water for Fresh Water End Suction Pumps	Rev 0 15May20
TD-030-003	External Seal Water for Double Suction Pumps	Rev 0 15May20
TD-030-004	Mechanical Seal Flush Water for End Suction Pumps	Rev 0 15May20

Typical Piping Details - Orifice Plates/Thermowells

TD-030-033	Flow Measuring Orifice Plate with Slip-On Flanges	Rev 0 15May20
TD-030-037	Thermowell in 3" Pipe and Smaller	Rev 0 15May20
TD-030-038	Thermowell in 4" Pipe and Larger	Rev 0 15May20

Typical Piping Details - Stainless Steel Pipe/Sampling Details

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TD-030-073	Thin Wall Stainless Steel Nozzle Weld Reinforcing Plate	Rev 0 15May20
	Typical Piping Details - Cleanouts/Hoses	
TD-030-086	Equipment Hose Connections	Rev 0 15May20
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TD-030-104	Flush or Drain Connection	Rev 0 15May20
TD-030-106	All Purpose Connection - 2" and Smaller	Rev 0 15May20
TD-030-111	Low Point Air Drain Connection	Rev 0 15May20
TD-030-112	Air and Water Utility Station	Rev 0 15May20
TD-030-121	Spectacle Blind, Class 150	Rev 0 15May20
TD-030-122	Paddle Blind and Ring Spacer, Class 150	Rev 0 15May20
TD-030-127	Underground/Above Ground Interface	Rev 0 15May20

INSULATION SPECIFICATIONS

Spec. No.	*Description*	*Revision*
SS-031-001	General Insulation and Installation	Rev 0 15Apr21

INSULATION MATERIAL SPECIFICATIONS

Spec. No.	*Description*	*Revision*
SS-031-000	Insulation Material Specification M15	Rev 0 15Apr21

PIPE LINE SUPPORTS AND HANGERS

Spec. No.	*Description*	*Revision*
ES-039-001	Pipe Support Presentation	Rev 0 07Dec18
SS-039-001	Pipe Support - Scope of Work	Rev 0 07Dec18
SS-039-002	Pipe Support Specification	Rev 0 07Dec18
SS-039-003	Support Assemblies & Identification Code	Rev 0 07Dec18
SS-039-004	Pipe Support Spans	Rev 0 07Dec18

PIPE SUPPORT DETAILS

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TD-039-HA01	Pipe Support Detail	Rev 0 15May20
TD-039-HA02	Pipe Support Detail	Rev 0 15May20
TD-039-HA03	Pipe Support Detail	Rev 0 15May20
TD-039-HA04	Pipe Support Detail	Rev 0 15May20
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TD-039-HA90	Pipe Support Detail	Rev 0 15May20
TD-039-HB01	Pipe Support Detail	Rev 0 15May20
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TD-039-HT02	Pipe Support Detail	Rev 0 15May20
TD-039-HT03	Pipe Support Detail	Rev 0 15May20
TD-039-HT04	Pipe Support Detail	Rev 0 15May20
TD-039-HT10	Pipe Support Detail	Rev 0 15May20
TD-039-HT11	Pipe Support Detail	Rev 0 15May20

Title:	**Table of Contents**		
Project Doc. No.:	**143993-ASA-DE2-SPC-1200**	Revision No.:	**0**

PIPE SUPPORT DETAILS

Spec. No.	*Description*	*Revision*
TD-039-HT12	Pipe Support Detail	Rev 0 15May20
TD-039-HT20	Pipe Support Detail	Rev 0 15May20
TD-039-HT21	Pipe Support Detail	Rev 0 15May20

PIPING SPECIFICATION

BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT	**SERVICE INDEX** Piping System Materials and Valve Selections By Service	Project No: Revision No: Revision Date:	245891 0 20Jul21

PROCESS FLUID		PIPING			VALVE SPECIFICATIONS									DESIGN
DESCRIPTION	CODE SYMBOL	MATERIAL SPECIFICATIONS		SIZE RANGE	GATE	GLOBE	CHECK	KNIFE GATE	PLUG	BALL	B'FLY	SPECIAL	INS CODE	PRESSURE TEMP. RATINGS
ABSORBER SUMP	ASD	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24			32GF (C21N)	41BA (K21V) 41BF (K21N)		67RF (B71N)		98AF (H21N)	M15 TE	50 PSIG MAX @ 140°F MAX
AIR, INSTRUMENT	IAI	S6T (CID) 316 SS	TUBING COMPR	½ - 1		27ER (L75X)	37ER (C75X)			67ER (B75X)			M15 TE	150 PSIG MAX @ 150°F MAX
		S4K (HID) 304L SS	SCH 40S SW	½ - 2	17AS (G71S)	27AS (L71S)	37AS (C71S)			67HS (B73S)		67HST (B73ST)	M15 TE	
		S4K (HID) 304L SS	SCH 10S BW	2½ - 24	17AF (G71N)	27AF (L71N)	37AF (C71N)				77AA (F71V)		M15 TE	
AIR, FORCED OXIDATION	FOA	S2K(HAD) (JAD) S32205	SCH 40S SW	½ - 2			38GF (C81N)			68GF (B81N)				30 PSIG MAX @ 300°F MAX
		S2K(HAD) (JAD) S32205	SCH 10S BW	2½ - 30			38GF (C81N)			68GF (B81N)	78AA (F81V)			
AIR, FORCED OXIDATION	FOA	C2G(HBD) (JBD) CS/BLK	SCH 80 SW	½ - 2						64HS (B43S)		64HST (B43ST)		30 PSIG MAX @ 300°F MAX
		C2G(HBD) (JBD) CS/BLK	STD WT BW	2½ - 30										
AIR, SERVICE	SAI	S6T (CID) 316 SS	TUBING COMPR	½ - 1		27ER (L75X)	37ER (C75X)			67ER (B75X)			M15 TE	150 PSIG MAX @ 150°F MAX
		C2G(HBD) (JBD) CS/BLK	SCH 80 SW	½ - 2	14CS (G43S)	24CS (L43S)	34CS (C43S)			64HS (B43S)		64HST (B43ST)	M15 TE	
		C2G(HBD) (JBD) CS/BLK	STD WT BW	2½ - 24	14AF (G41N)	24AF (L41N)	34AF (C41N)				74AA (F41V)		M15 TE	
DRAINS	EDR	MATERIAL SPECIFICATIONS CODES AND SIZES SHALL BE AS SHOWN ON THE DRAWINGS.												ATMOSPHERIC
DRAIN, STACK	SDD	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24										15 PSIG MAX @ 180°F MAX

PIPING SPECIFICATION

BIG RIVERS ELECRIC CORP.
D. B. WILSON STATION
FGD RETROFIT

SERVICE INDEX

Piping System Materials and
Valve Selections By Service

Project No: 245891
Revision No: 0
Revision Date: 20Jul21

PROCESS FLUID		PIPING			VALVE SPECIFICATIONS									DESIGN
DESCRIPTION	CODE SYMBOL	MATERIAL SPECIFICATIONS		SIZE RANGE	GATE	GLOBE	CHECK	KNIFE GATE	PLUG	BALL	B'FLY	SPECIAL	INS CODE	PRESSURE TEMP. RATINGS
DRAIN, FOAM DAM	LRS	N2C(HAD) (JAD) N10276	SCH 40S SW	½ - 2			38GF (C81N)			68GF (B81N)				20 PSIG MAX @ 250°F MAX
		N2C(HAD) (JAD) N10276	SCH 10S BW	2½ - 24			38GF (C81N)			68GF (B81N)	78AA (F81V)			
MIST ELIMINATOR WASH	WWA	C2G(HBD) (JBD) CS/BLK	SCH 80 SW	½ - 2	14CS (G43S)	24CS (L43S)	34CS (C43S)		51AF (P11N)	64HS (B43S)		64HST (B43ST)	M15 TE	125 PSIG MAX @ 100°F MAX
		C2G(HBD) (JBD) CS/BLK	STD WT BW	2½ - 24	14AF (G41N)	24AF (L41N)	34AF (C41N)		51AF (P11N)	64AF (B41N)	71AA (F11V)		M15 TE	
OIL, RECYCLE PUMP HYDRAULIC	LHY	S4J (CID) 304L SS	SCH 160 SW	½ - 2										3000 PSIG MAX @ 150°F MAX
		S4J (CID) 304L SS	SCH 160 BW	2½ - 3										
OIL, LUBE	LOL	S4K (HID) 304L SS	SCH 40S SW	½ - 2	17AS (G71S)	27AS (L71S)	37AS (C71S)			67HS (B73S)		67HST (B73ST)		100 PSIG MAX @ 200°F MAX
		S4K (HID) 304L SS	SCH 10S BW	2½ - 24	17AF (G71N)	27AF (L71N)	37AF (C71N)				77AA (F71V)			
SLURRY, LIMESTONE	LSS	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24			32GF (C21N)	41BA (K21V) 41BF (K21N)		67RF (B71N)		98AF (H21N)		85 PSIG MAX @ 130°F MAX
SLURRY, RECYCLE	LRS	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24			32GF (C21N)	41BA (K21V) 41BF (K21N)	58AF (P81N)	67RF (B71N)		98AF (H21N)		70 PSIG MAX @ 140°F MAX
SLURRY, WASTE	LWS	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24			32GF (C21N)	41BA (K21V) 41BF (K21N)	58AF (P81N)	67RF (B71N)		98AF (H21N)		105 PSIG MAX @ 140°F MAX
WATER, POTABLE	WPW	S4K (HID) 304L SS	SCH 40S SW	½ - 2			37NSFA (C71W)			67NSFS (B73S)			M15 TE	150 PSIG MAX @ 150°F MAX
		S4K (HID) 304L SS	SCH 10S BW	2½ - 24			37NSFA (C71W)				71NSFA (F11V)		M15 TE	
WATER, POTABLE (UNDERGROUND)	WPW	P8P(H_G) HDPE	SDR 17 BW	2 - 20										100 PSIG MAX @ 90°F MAX

PIPING SPECIFICATION

BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT	**SERVICE INDEX** Piping System Materials and Valve Selections By Service	Project No: Revision No: Revision Date:	245891 0 20Jul21

PROCESS FLUID		PIPING			VALVE SPECIFICATIONS									DESIGN
DESCRIPTION	CODE SYMBOL	MATERIAL SPECIFICATIONS		SIZE RANGE	GATE	GLOBE	CHECK	KNIFE GATE	PLUG	BALL	B'FLY	SPECIAL	INS CODE	PRESSURE TEMP. RATINGS
WATER, POTABLE (UNDERGROUND)	WPW	P9A(HKG) PVC	SCH 80 BW	½ - 12										100 PSIG MAX @ 90°F MAX
WATER, QUENCH	WQW	N2C(HAD) (JAD) N10276	SCH 40S SW	½ - 2			38GF (C81N)			68GF (B81N)			M15 TE	20 PSIG MAX @ 250°F MAX
		N2C(HAD) (JAD) N10276	SCH 10S BW	2½ - 24			38GF (C81N)			68GF (B81N)	78AA (F81V)		M15 TE	
WATER, QUENCH	WQW	C2G(HBD) (JBD) CS/BLK	SCH 80 SW	½ - 2						64HS (B43S)		64HST (B43ST)	M15 TE	20 PSIG MAX @ 250°F MAX
		C2G(HBD) (JBD) CS/BLK	STD WT BW	2½ - 24									M15 TE	
WATER, RECLAIM	WRW	F3A (HZD) (JZD) FRP	SPEC BW	1 - 24			32GF (C21N)	41BA (K21V) 41BF (K21N)	58AF (P81N)	67RF (B71N)		98AF (H21N)	M15 TE	62 PSIG MAX @ 130°F MAX
WATER, RECLAIM (UNDERGROUND)	WRW	P8X (H_D) HDPE	SDR 11 BW	2 - 20										62 PSIG MAX @ 130°F MAX
WATER, SERVICE	WSW	C2G(HBD) (JBD) CS/BLK	SCH 80 SW	½ - 2	14CS (G43S)	24CS (L43S)	34CS (C43S)		51AF (P11N)	64HS (B43S)		64HST (B43ST)	M15 TE	125 PSIG MAX @ 100°F MAX
		C2G(HBD) (JBD) CS/BLK	STD WT BW	2½ - 24	14AF (G41N)	24AF (L41N)	34AF (C41N)		51AF (P11N)	64AF (B41N)	71AA (F11V)		M15 TE	
WATER, SERVICE (UNDERGROUND)	WSW	P8X (H_D) HDPE	SDR 11 BW	2 - 20										125 PSIG MAX @ 100°F MAX

The Identification Codes shown in (RED in Brackets) on the Service Index, Piping Material Specifications and Valve Specifications of this document are in accordance with Wood P&ID Legend Sheet 143993-03-100. These Identification Codes shall be used for the Pipeline List, Valve List and P&ID.

Wood equivalent Identification Codes shown in this document are used for Balance of Plant Piping Isometrics. (Material provided by Contractor)

Piping Specification

Title:	**Codes and Standards**		
Project Doc. No.:	**SS-030-002**	Revision No.:	**0**

Project Name:	**FGD RETROFIT**	Project No.:	**245891**
Client:	**BIG RIVERS ELECTRIC CORP.**	Plant/Area No.:	**D. B. WILSON STATION**

Rev	Date	Issued For	Prepared	Checked	Approved	
A	22Feb21	Standard		CKF	TCS	
B	25Mar21	Bids	FZ/CKF	CKF	TCS	
0	20Jul21	Construction	FZ/CKF	CKF	TCS	

1. CODES AND STANDARDS

1.1. ASSOCIATIONS AND AGENCIES

The following associations and agencies publish codes and standards, which are referenced in the Piping Specifications. All codes and standard referenced in, and applicable to, the Piping Specifications shall be the latest edition published and are hereby made part of these specifications. Unless agreement is specifically made between contracting parties to use another issue, or the regulatory body having jurisdiction imposes the use of another issue, the latest Edition and Addenda of the ASME Piping Code issued at least 6 months prior to the original contract shall be the governing document.

- AAR, Association of American Railroads
- AISI, American Iron and Steel Institute
- ANSI, American National Standards Institute
- API, American Petroleum Institute
- ASME, American Society of Mechanical Engineers
- ASNT, The American Society of Nondestructive Testing
- ASTM, American Society for Testing and Materials
- AWS, American Welding Society
- AWWA, American Water Works Association
- MSS, Manufacturers' Standardization Society
- NFPA, National Fire Protection Association
- NIST, National Institute of Standards and Technology
- NSF, National Sanitation Foundation
- PFI, Pipe Fabrication Institute
- PPI, The Plastic Pipe Institute Inc.
- SAE, Society of Automotive Engineers

1.2. CODES

1.2.1. *Power Piping*. For power piping, including, but not limited to steam and condensate piping, ASME B31.1, power piping, shall be used as a design basis, except that boiler external piping, as defined by ASME B31.1, shall also conform to the rules of Section I of the ASME Boiler and Pressure Vessel Code (B&PVC)

1.2.2. *Potable Water Piping*, shall be in compliance with the International Plumbing Code, and all local Codes and Standards.

1.2.3. *Federal, State, And Local Codes*. When they have jurisdiction and are more stringent than the ASME and ANSI codes Standards, they shall govern the design.

1.2.4. *Occupational Safety And Health Standards* published by Occupational Safety and Health Administration, by the Department of Labor, as Part 1910, shall apply.

1.3. STANDARDS

1.3.1. *Industry Standards*. Pipe, fittings, valves, and other piping system components are sized according to dimensional standard developed by industry. The numbers of applicable standards are listed in the material specifications.

1.3.2. *Standards* applicable to this project are referred to by number and are either included in this specification or shown on the drawings.

END OF DOCUMENT

Piping Specification

Title:	**Welding General**		
Project Doc. No.:	**SS-030-010**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	

1. WELDING, GENERAL

1.1. SCOPE

This section covers procedure and performance qualifications, and general requirements for welding. Requirements specified in this standard shall apply to the following.

- SS-030-011, Welding of Carbon Steel Piping
- SS-030-012, Welding of Alloy Steel Pipe
- SS-030-013, Welding of Stainless Steel Piping
- SS-030-014, Welding of Aluminum
- SS-030-015, Welding of Titanium
- SS-030-016, Welding of Hastelloy C-276

1.2. CODES AND STANDARDS

Welding procedure qualifications, welding performance qualifications and materials and workmanship shall conform to the applicable sections of the following codes and standards:

- ASME Boiler and Pressure Vessel Code (BPV), Sections I, II, VIII, and IX
- ASME Codes for Pressure Piping, B31.1, B31.3, B31.5, B31.8
- American Welding Society Specifications

2. WELDING PROCEDURE QUALIFICATION

2.1. CODE CONFORMITY

All welding shall be performed in accordance with welding procedures, which have been qualified in conformity with Section IX of the ASME BPV Code.

2.2. CONFORMANCE RESPONSIBILITY

The contractor shall be responsible for ascertaining that his welding procedures are current and that each qualification is acceptable to the authorized inspection authorities.

2.3. SUBMITTALS

The contractor shall submit three (3) copies each of his welding procedures to the owner and to the owner's insurance representative for approval. The methods shall be fully described, including the number of beads, the voltage, the amperage and the welding electrodes for the various pipe wall thicknesses and materials. These procedures shall be used for all pipe welder qualification tests, all shop welds, and all field welds.

2.4. APPROVAL

The owner's representative shall approve the contractor's welding procedure in writing before any welding is done.

3. WELDING PERFORMANCE (WELDERS) QUALIFICATION

3.1. BOILER EXTERNAL PIPING

Piping external to boilers, as defined in the ASME Code for Pressure Piping, ASME B31.1, Power Piping, shall be welded by welders qualified in accordance with the ASME Boiler and Pressure Vessel Code, Section I and IX.

3.2. PROCESS AND SERVICE PIPING

Welding in process and service lines shall be made by welders qualified according to ASME Code for Pressure Piping, Power Piping, ASME B31.1, and/or Chemical Plant Piping, ASME B31.3, as specified in Paragraph 1.2.

3.3. QUALIFICATIONS RESPONSIBILITY

The welding contractor shall be responsible for welding done by welding operators employed by him and shall be responsible for qualifying his welder as required by the referenced codes and standards.

3.4. QUALIFICATION RECORDS

The welding contractor shall maintain a record of the procedures used and the welders or welding operators employed by him, showing the date and results of procedure and performance qualification. Each welder or welding operator shall be assigned a unique identification number, letter or symbol. A copy of the list of qualified welders and their symbol shall be furnished to the owner's representative. All records shall be certified by the contractor and available to the owner's representative and inspector.

3.5. WELDER IDENTIFICATION

3.5.1. Each weld, or group of welds in close proximity, shall be stamped or stenciled with the welder's or welding operator's identification symbol adjacent to the weld or group of welds or at 3 ft intervals for plate welds. Stamps shall be made with blunt-nose, continuous or interrupted dot die stamps and stencils shall be made with permanent markers that are non-corrosive to stainless or alloy steels.

3.5.2. As an alternative, each weld shall be recorded on a Weld Map or Weld Data Form to establish weld location and welder or welding operator identification. This document shall be kept current and submitted to the owner upon project completion.

4. QUALITY OF WELDING AND GENERAL REQUIREMENTS

4.1. BUTT WELDS

Butt welds shall have complete joint penetration. The surfaces of the weld may be left "as welded" provided they are sufficiently free from coarse ripples, grooves, overlaps, abrupt ridges, and valleys to avoid stress risers.

4.2. UNDERCUTS

Undercuts shall not exceed $^{1}/_{32}$ inch (0.8 mm) or 10% of the wall thickness, whichever is less, and shall not encroach on the required section thickness or interfere with interpretation when radiography is performed.

4.3. REINFORCEMENT

Maximum Reinforcement. To assure that the butt weld grooves are completely filled so that the surface of the weld metal at any point is not below the surface of the adjoining base materials, weld metal may be added as reinforcement on each face of the weld. The maximum thickness of the weld reinforcement on each face shall not exceed the following:

Nominal Thickness (in.)	Maximum Reinforcement (in.)
Up to $^{1}/_{8}$	$^{3}/_{32}$
Over $^{1}/_{8}$ to $^{3}/_{16}$	$^{1}/_{8}$
Over $^{3}/_{16}$ to ½	$^{5}/_{32}$
Over ½ to 1, incl.	$^{3}/_{16}$
Over 1 to 2, incl.	¼

Note: For joints with nominal wall thickness exceeding 2 inches the reinforcing may be the greater of ¼ inch or 0.125 times the width of the weld in inches.

4.3.2. *Double Welded Butt Joints.* The limitation on reinforcing given above shall apply separately to both inside and outside surfaces of the joint.

4.3.3. *Single Welded Butt Joints.* The reinforcement limits given above shall apply to the outside surfaces of the joint only.

4.3.4. *Thickness of weld reinforcement* shall be based on the thickness of the thinner of the materials being joined. Weld reinforcement thicknesses shall be determined from the high point of the abutting surfaces involved. Weld reinforcement may be removed if so desired.

4.4. CLEANING

After deposition, each layer of weld metal shall be cleaned to remove all slag and scale by wire brushing or grinding, then chipping where necessary to prepare for proper deposition of the next layer.

4.5. SEAL WELDING

Seal welding shall be done by qualified welders where shown on the drawings or called for in these specifications. The fittings shall be made tight using no thread compound. The sealing bead shall be laid around the joint. The size of the fillet shall be large enough to completely cover the exposed pipe thread.

4.6. SOCKET WELDING

Where socket welding valves or fittings are used, the area on which welding will be preformed shall be thoroughly cleaned before welding operation is started. In order to prevent undue stress in the weld due to thermal expansion, the pipe shall be spaced in the socket so that approximately $^{1}/_{16}$ inch clearance will exist between the end of the pipe and the bottom of the socket.

4.7. TACK WELDING

Joints shall be in proper alignment and held with clamps before tack welding. The length of the tack welds shall not be more than twice the thickness of the pipe. Tack welds shall be kept as thin as possible and shall be completely removed during the welding operation.

4.8. BACKING RINGS OR CONSUMABLE INSERTS

Backing rings and consumable inserts shall not be used unless specifically called for in the

procedure specification.

END OF DOCUMENT

Piping Specification

Title:	**Welding of Carbon Steel**		
Project Doc. No.:	**SS-030-011**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	

1. WELDING OF CARBON STEEL PIPING

1.1. SCOPE

This section covers shop and field welding of carbon steel pressure piping manufactured from P-No. 1 carbon steel per Table Al of ASME B31.1 or ASME B31.3.

1.2. CODES AND STANDARDS

All requirements listed in SS-030-002 and SS-030-010 shall apply.

2. PREPARATION FOR WELDING

2.1. CLEANING

Metal that is to be fused during welding shall be clean and free from lubricants, grease, paint, filings, rust, scale and other materials detrimental to welding. Cleaning may be done only with alcohol or acetone. Chlorinated solvents shall not be used.

2.2. JOINT ALIGNMENT

Joint alignment shall be carried out with mechanical devices. Under no circumstances shall heat be used in the alignment of joints. The inside diameters of piping shall be aligned as accurately as is practicable within existing commercial tolerances on diameters, wall thicknesses, and out-of-roundness. Alignment shall be preserved during welding. Where ends are joined and the internal misalignment exceeds $^{1}/_{16}$ inch (2.0 mm), it is preferred that the component with the wall extending internally be internally trimmed so that adjoining internal surfaces are approximately flush. This trimming shall not result in a piping component wall thickness being less than the minimum design thickness and the change in contour shall not exceed 30 degrees. The root opening of the joint shall be as given in the procedure specifications.

2.3. END PREPARATION

The ends of the sheets or pipes to be jointed shall be prepared by shearing, machining, sawing, or grinding. All burrs shall be removed. If oxygen or arc cutting is performed, all slag must be cleaned from the weld surface by grinding or machining. When required, pipe shall be machined to match up the prepared ends. End preparation shall conform to ASME B16.25.

3. PREHEATING

3.1. PREHEAT CRITERIA

3.1.1. *Preheating*. The metal adjacent to the weld zone shall be heated before starting the welding operation and maintained at the designated temperature during the welding operation. Preheating shall be required as follows:

- All preheating shall be performed in accordance with the Welding Procedure Specification (WPS), which shall adhear to the requirements of the applicable Code.

3.2. METHOD

Preheating shall be accomplished by any suitable means, such as electric induction coils, electric resistance coils, gas ring or torch, which will provide the required metal temperature uniformity, and temperature control. Heating shall be controlled by means of Tempistiks, thermocouples or other approved temperature indicating devices.

4. WELDING PROCESS AND ELECTRODES

4.1. GAS TUNGSTEN ARC WELDING (GTAW)

The Gas Tungsten Arc Welding (GTAW) process shall be used for all root and hot passes in butt welds, and all socket welds.

4.2. SHIELDED METAL ARC WELDING (SMAW)

Shielded metal arc welding shall be used for all passes where GTAW welding is not specified.

4.3. ELECTRODES

Welding electrodes shall be compatible with parent metal and shall be in accordance with the Welding Procedure Specification.

5. POSTWELD HEAT TREATMENT (PWHT)

5.1. EXEMPTIONS

Postweld heat treatment for P1 carbon steel is not required provided that the minimum preheat temperature has been applied and maintained in accordance with the applicable Code. These exclusionary requirements apply also to attachment welds. Approved welding procedures may require postweld heat treatment and if this is the case they shall govern.

5.2. TIMING

It is preferred that the heat treatment take place as soon as practical after the welding operation. Heat treatment may be delayed however, if the welds are tightly covered with heat-retaining blankets after welding and allowed to cool slowly.

5.3. HEATING AND COOLING RATES

Above 600°F the rate of heating and cooling shall not exceed 600°F per hour divided by one-half the maximum thickness of material in inches at the weld but in no case shall the rate exceed 600°F per hour.

5.4. HEATING METHODS

5.4.1. *Furnace Heating* shall be used when practical; however, the size or shape of the unit or the adverse effect of a desired heat treatment on one or more components where dissimilar materials are involved, may dictate alternative procedures such as heating a section before assembly, or by applying local heating in accordance with Paragraph 5.4.2.

5.4.2. *Local Heating* using electric resistance or induction coils or circumferential torches shall be used for field joints. Welds shall be locally postweld heat treated by heating a circumferential band around the entire component with the weld located in the center of the band. The width of the band heated to the PWHT temperature for girth welds shall be at least three times the wall thickness at the weld of the thickest part being joined. For nozzle and attachment welds, the width of the band heated to the PWHT temperature shall extend beyond the nozzle weld or attachment weld on each side at least two times the header thickness and shall extend completely around the header.

5.5. PWHT TEMPERATURE

All holding temperature ranges and durations shall be in accordance with the applicable Code and the Welding Procedure Specification.

5.6. RECORDS

Records of all postweld heat treatment operations shall be kept and furnished to the owner or owner's representative upon request.

END OF DOCUMENT

Piping Specification

Title:	**Welding of Stainless Steel**		
Project Doc. No.:	**SS-030-013**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	

1. WELDING OF STAINLESS STEEL PIPING

1.1. SCOPE

This section covers shop and field welding of AISI Series 300 low-carbon (0.035% C maximum) stainless steel piping.

1.2. FABRICATION

Stainless steel piping shall be prefabricated in sections suitable for transporting and handling. Field welds shall be held to a minimum. Where mitered elbows are used, the two end sections of the elbows may be an integral part of the pipe eliminating the end butt welds.

1.3. CODES AND STANDARDS

All requirements listed in SS-030-002 and SS-030-010 shall be applicable.

2. PREPARATION FOR WELDING

2.1. EQUIPMENT

2.1.1. *Material compatibility*. All equipment used in welding preparation shall be covered or faced with material which will prevent mild steel particles from contaminating the stainless steel material. Equipment used to prepare welded joints such as ground clamps, wire brushes, steel wool, chisels, files, and peen hammers shall be made from stainless steel. All these items shall be marked “Stainless Steel”. Grinding wheels shall be those, which have been used solely for stainless steel.

2.1.2. *Forming operations*. To prevent work hardening of the pipe material, equipment settings for a forming operation shall be determined by a test specimen rather than material that will form the finished product.

2.2. END PREPARATION

2.2.1. *Method*. The ends of pipes to be joined shall be prepared by shearing, machining, sawing, or grinding. All burrs shall be removed. Cutting shall *not* be done with gas cutting equipment. Electric-arc cutting shall be done with prior approval only.

2.2.2. *Square butts*. Material 11 U.S.S. gauge (.125 inch) and thinner may be welded using a square butt or may be beveled as required for a particular welding procedure specification.

2.2.3. *Bevels*. Metal 10 U.S.S. gauge (.140 inch) and thicker shall be beveled 37½ degrees with a $^{1}/_{16}$ inch landing at the root. Standard schedule pipe shall be prepared in accordance with ASME B16.25 and the welding procedure specification.

2.3. GAP DIMENSIONS

Gap for welding ends shall be as specified in the welding procedure specification. The welding procedure specification shall be submitted to owner’s representative as required in paragraph 3.4, below.

2.4. CLEANING

All metal that is to be fused during welding shall be clean of lubricants, grease, paint, filings and cuttings. Cleaning shall be done only with alcohol or acetone. Chlorinated solvents shall not be used.

2.5. JOINT ALIGNMENT

Alignment of joints shall be carried out with mechanical devices and shall be free of depressions and bumps. Under no circumstances shall heat be used in the alignment of joints. On butt weld joints the inside surfaces of the pipes to be joined shall be aligned so that the misalignment will not exceed $^{1}/_{32}$ inch at any point along the inside circumference.

3. WELDING PROCESS AND ELECTRODES

3.1. GTAW AND GMAW WELDING

For shop welding the GMAW process may be used if used in conjunction with semi-automatic or automatic machine welding. Gas Tungsten Arc Welding (GTAW) shall be used for manual field welding of all stainless steel pipe joints. Shielding gas protection shall be applied on the underside of the weld. Alternate methods of shielding, such as Solar-Flux compound or backing tapes, shall not be used. Electrodes shall be non-consumable tungsten AWS 5.12, type EWTh-2 for direct current, and type EWTh-3 for alternating current. Filler metal shall conform to AWS A5.9 as follows:

Pipe Material	Filler Metal
AISI 304L	ER3XX
AISI 316L	ER3XX
AISI 317L	ER3XX
Carbon Steel to SS	ER3XX

3.2. SMA WELDING

Shielded Metallic Arc welding shall be used for joining stainless steel to carbon steel. It shall not be used for critical pipe joints, where maintenance of high corrosion resistance is required, except when such use is specifically approved in writing by the owner's representative. Electrodes shall conform to AWS A5.4 as follows:

Pipe Material	Electrode
AISI 304L	E3XX
AISI 316L	E3XX
AISI 317L	E3XX
Carbon Steel to SS	E3XX

3.3. SHIELDING GAS

Welding grade Argon or Helium-Argon mixture.

3.4. WELDING PROCEDURE

Welding procedure specifications shall be submitted to the owner's representative for approval before commencing work and as specified in SS-030-010.

3.5. PENETRATION

Butt welded joints shall have 100% penetration.

3.6. WELD FINISH

The inside of all welds shall be smooth and free of projections or depressions. Whenever grinding is specified in order to acquire a smooth weld, it shall be done with a the appropriate grinding wheel. The process on which the stainless steel piping will be used requires the utmost attention to the internal surface of the pipe. All field and shop welds must be as smooth as can be obtained by modern welding techniques. Any projections, crevices, or roughness shall constitute cause for rejection.

3.7. TACK WELDING

Tack welds shall be made small enough to allow them to be absorbed into the following beads and they shall have all slag and oxides removed in advance of making the finished weld.

3.8. DISSIMILAR METALS

Carbon steel support members shall not be welded directly to stainless steel pipe. A stainless steel pad, equal to the thickness of the pipe material shall be welded to the pipe and carbon steel then attached to the pad.

3.9. CLEANING OF WELDS

All scale, oxides, and discoloration shall be removed from the pipe and welds in accordance with ASTM A380 and A967 in order to provide maximum corrosion resistance and minimum product contamination.

END OF DOCUMENT

Piping Specification

Title:	**Fabrication and Installation of Carbon Steel**		
Project Doc. No.:	**SS-030-020**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	Client
0	07Dec18	Standard		CKF	TCS	

1. **SCOPE**

This specification covers materials and methods for shop and field fabrication and installation of carbon steel piping.

1.1. EXCLUSIONS

This specification is intended for above ground piping only. Installation for underground piping is specified in the project construction specifications.

2. **MATERIALS, CODES AND STANDARDS**

2.1.1. *Material Standards*. All materials shall conform to ASTM material specifications as listed in the applicable Piping Material Specification.

2.1.2. *All Workmanship* shall be of the highest quality and performed in accordance with the applicable ASME Piping Codes and PFI Standards.

2.1.3. *Consensus Standards*. In addition to applicable codes and dimensional standards listed in SS-030-002, the following standards shall apply:

- SS-030-010, Welding, General
- SS-030-011, Welding of Carbon Steel
- SS-030-031, Cleaning and Testing of Pipe

3 **SHOP PRACTICES** (Applies to field fabrication)

3.1 DIMENSIONS

For the purpose of shop fabrication, the dimensions shown on the drawings shall be taken as approximate only. They do not take into account minor dimensional variations, which are unavoidable in the pouring of concrete, erecting of steel, and setting and installing of equipment and other piping. Before shop fabrication is commenced, a field check must be made by the Contractor to determine these field variations from the dimensions shown on the drawings. All shop fabrication must take into account these dimensional field variations to ascertain correct fit.

Dimensions of fabricated pipe and fittings shall conform to the following standards:

- ASME B36.10M, Welded and Seamless Wrought Steel Pipe
- ASME B16.5, Steel Pipe Flanges
- ASME B16.47 Large Diameter Steel Flanges
- ASME B16.9, Steel Butt Welding Fittings
- ASME B16.11. Steel Socket Welding Fittings
- ASME B16.25, Butt Welding Ends
- ASME B16.36, Steel Orifice Flanges
- ASME B1.20.1, Pipe Threads
- ASME B18.2.1, Bolts, Screws, and Studs
- ASME B18.2.2, Nuts
- ASME B18.22.1, Washers

3.2 TOLERANCES

Fabrication tolerances shall conform to PFI Standard ES-3.

3.3 FIELD WELDS

The contractor shall determine field weld locations and pipe spool size with consideration given to floor and wall penetrations, shipping and installation constraints and accuracy of fit. A four inch field trim allowance shall be added to pipe ends where required to adjust for field variances. This shall be determined by the field check as required above.

3.4 MARKING

Fabricated pipe sections shall have the line number and spool number neatly painted on each section with a paint that will not wash off or fade in accordance with PFI Standard ES-11.

3.5 CLEANING

The interior of fabricated pipe spools shall be free of loose scale, sand, weld spatter particles, rust, cutting chips in accordance with PFI ES-5 Standard Cleaning. All heat treated, prefabricated pipe shall be blast cleaned in accordance with PFI ES-29 to a Level No. 2 surface finish upon completion of all welding and heat treatment operations. These lines shall then be sealed for transport and storage.

3.6 COATING

All carbon steel pipe shall be shop coated. The type of coating shall be determined by the maximum design temperature, exposure and insulation requirements. Insulated and jacketed lines shall require a primer coat only. See project painting specification for material and application details. Color shall be project specific.

3.7 LABELING

Pipe labeling is used to identify the contents of pipes, to denote pressure and temperature hazards as a part of the legend when appropriate, and to indicate direction of flow.

Color coding is used to identify the characteristic hazard or physical properties of the pipe contents. It also denotes the use or function of the piping system in the case of fire protection piping.

Labels indicating line contents and direction of flow shall be furnish and installed by the contractor for all aboveground piping following the application of final coating or insulation and lagging. All pipe labels shall conform to, and be installed in accordance with ASME A13.1.

3.8 PROTECTION

Flange faces, male threads and plain or machine beveled ends shall be protected from damage during shipment in accordance with PFI-31. Plywood discs shall be bolted into place.

3.9 SHIPPING AND HANDLING

Shipping and Handling shall be performed in accordance with PFI ES-37. Fabricated pipe sections shall be stored and protected in a manner that will prevent them from being damaged.

4 PREPARATION

4.1 BENDING

Where pipe bends are shown on the drawings or specifically called for in the Piping Material Specification they shall have a centerline radius of five nominal pipe diameters, unless otherwise specified. The pipe, after bending, shall have a circular cross section and the reduced wall thickness shall be above the minimum required by Code. Bends shall be free of buckles

and blisters. The difference between maximum and minimum diameter shall not be greater than 5%. Only seamless piping of ASTM designation suitable for bending shall be bent. Bending of pipe in gas or fuel oil lines is not permitted. Where pipe is cold bent on special equipment to a radius of less than five pipe diameters, the bends shall be stress relieved. This close bending shall be used only where specifically called for.

4.2 CUTTING

Cutting shall be performed with band saw, chop saw or oxyacetelyne torch. Cut ends shall be square and free from sharp edges, slag or burrs.

4.3 MACHINING / END PREP

Buttwelding ends for pipe joints shall be prepared in accordance with ASME B16.25

5 ASSEMBLY

5.1 WELDING

For welding refer to the specifications referenced above.

5.2 SOCKETWELDING

Pipe shall be inserted into the socketweld fitting until it reaches bottom, then backed out $^{1}/_{16}$" before welding.

5.3 PIPE THREADING

Threading of pipe shall be performed in the following manner:

5.3.1. *Threading machine* shall be thoroughly cleaned and the lubricant pump and screen in good working order. Threading oil shall be a heavy sulfur based type.

5.3.2. *High speed dies* in new condition in a self-opening expanded die head shall be used.

5.3.3. *Cutting speed* shall be adjusted to the type of equipment used. Flush the work off continuously with threading oil.

5.3.4. *Thread Lengths*. Cut threads to length exactly equal to the width of the die.

5.3.5. *Cleanup.* Wash threads clean with solvent to remove any cutting oil or grease before applying thread sealant specified in the Gasket Material Specification SS-030-121.

5.3.6. Thread Sealant shall be used on all threaded connections that are not required to be seal welded. Threaded connections where seal welding is specified shall be made up clean and dry.

5.3.7. *Teflon thread tape.* If Teflon thread tape is used, the wrapping shall start approximately two threads from the end of the pipe. Apply Teflon tape so that it will tighten when the joint is threaded together. When Teflon taped joints are broken, all traces of the old tape shall be removed before applying new tape and reassembling the joint.

5.3 FLANGE CONNECTION

5.3.1. *Excluded Flange Material Sources*. In accordance with a special bulletin of the National Board of Boiler and Pressure Vessel Inspectors, the following sources and types of flanges are hereby excluded from this specification and shall not be supplied for this project (Reference: *National Board Bulletin*, Volume 48, Number 2 [Special Edition]).

5.3.1.1 Excluded in general are any and all manufactured flanges, fittings, or other piping material components which do not carry the appropriate and correct markings as required by the applicable ASME standard and which have not been tested according to specification.

5.3.1.2 Excluded specifically are any and all flanges originating in China and bearing the source marking “China” irrespective of any of the other markings on the flange, which may be correct or incorrect per the applicable standards. Also excluded are flanges which bear the marking “A-105 LEO 6 150 RFWN STD B-16” but do not bear the “China” source marking. Numerous flanges of Chinese manufacture have been found to be defective and have failed during hydrostatic testing. Material analysis has shown that a number of flanges do not conform to ASTM A105. Until it can be shown that the manufacturing process of Chinese ANSI flanges has been changed to produce flanges conforming to ASME B16.5 and ASTM A105, flanges originating in China shall not be accepted under this specification.

5.3.2 *Flange Assembly*

5.3.2.1 Flanges shall be installed with faces perpendicular to the centerline of pipe.

5.3.2.2 Flange bolt holes shall straddle pipe centerline (two-holed).

5.3.2.3 Instrument orifice plate flange connections shall have all weld spatter removed, and have the inside of the welds ground smooth before installation.

5.3.3 Flange Bolting

5.3.3.1 Flange bolting, when tightened shall be flush with the top of nut as a minimum.

5.3.3.2 All bolting shall be UNC or UN8 per the applicable ASTM Standard. All bolt threads shall be coated with the specified lubricant prior to assembly.

5.3.4 *Weldingneck Flanges* shall have the inside diameter of the flange taper bored to suit the inside diameter of the matching pipe.

5.3.5 *Slip-on Flanges* shall have both the structural and seal side of the flange welded. Set pipe back from the flange face the lesser of the pipe wall thickness or ¼”.

5.3.6 *Forged steel flanges* shall be flat face when connecting to flat face cast iron valves and equipment flanges. Raised face flanges shall have either a spiral or concentric standard finish on the raised face.

5.3.7 *Forged steel flanges* produced to ASTM A105 shall have dimensional standards conforming to ASME B16.5 for sizes up to and including 24 inches. Flanges larger than 24 inches shall be large diameter ASME flanges, with dimensions and drilling conforming to ASME B16.47 Series A. These large diameter flanges are available as weldingneck type.

6 INSTALLATION

6.1 VALVES

6.1.1 Valve Stems shall not obstruct walkways or platforms and be easily accessible for operation and maintenance. Valve should be preferably positioned with the stem pointing upwards. Where this is not possible horizontal or above is preferable. Avoid stem positions below horizontal.

6.1.2 *Valves 2 inches and smaller* in vertical lines shall have the handwheel located at right angle to centerline of header. If this is not possible, orient handwheel for ease of operation.

6.1.3 *Inline Unidirectional devices* such as check, globe and other valves, strainers and instruments shall be checked for correct orientation.

6.1.4 *Butterfly Valves* shall be checked for disc clearance after installation.

6.2 TERMINAL POINTS

Pipe connecting to equipment shall be fully examined before and after attachment to assure that minimal forces are place on the equipment. Nozzle loads for rotating equipment shall meet API, NEMA or manufacturer requirements.

6.3 TRAPS AND STRAINERS

Steam traps and strainers are specified in SS-030-132 and SS-030-142. Size, type, and arrangement shall be as indicated on the drawings. Strainers shall be installed upstream of all traps that do not have them built in. By-passes or upstream free-blows and block valve shall be provided at all traps, unless shown otherwise on drawings. All strainers shall be equipped with blow down valves.

END OF DOCUMENT

Piping Specification

Title:	**Fabrication and Installation of Stainless Steel**	
Project Doc. No.:	**SS-030-021**	Revision No.: **0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	

1. FABRICATION AND INSTALLATION - STAINLESS STEEL

1.1. SCOPE

This specification covers the fabrication and installation of AISI series 300 austenitic stainless steel piping.

1.2. DESIGN BASIS

1.2.1. *The allowable stress* values given in ASME B31.1 shall be used for wall thickness design of all piping.

1.2.2. *This specification* is applicable primarily to thin wall piping (gauge thickness, Schedule 5S and 10S). Heavy wall stainless steel piping, Schedule 40S and 80S shall be designed in accordance with ASME B31.1 or B31.3 and shall follow the requirements specified for the design of branch connections in carbon and alloy steel piping, SS-030-020.

1.3. CODES AND STANDARDS

In addition to applicable codes and standards listed in SS-030-002, the following standards shall apply:

- SS-030-010, Welding, General
- SS-030-013, Welding of Stainless Steel Piping
- SS-030-031, Cleaning and Testing

1.4. DIMENSIONS

Dimensions of fabricated stainless steel piping shall conform to the dimensions for manufactured pipe in ASME B36.19M. Fitting and flanges shall be manufactured to the dimensions given in TD-030-101 and TD-030-102 or ASME B16.9 or B16.5.

1.5. TOLERANCES

Tolerances for fabrication of piping shall conform to PFI Standard ES-3.

1.6. IDENTIFICATION

Fabricated pipe sections shall have the line number and spool number neatly painted on each section with a paint that will not wash off or fade. Each piece of pipe section shall be identified with the type of stainless steel used, either by means of a stamped stainless steel tag, tack welded to the assembly, or by a clearly visible dye stamp.

2. SHOP FABRICATION

2.1. DIMENSIONS

For the purpose of shop fabrication, the dimensions shown on the drawings shall be taken as approximate only. They do not take into account minor dimensional variations, which are unavoidable in the pouring of concrete, erection of steel, and setting and installing of equipment and other piping. Before shop fabrication is commenced a field check must be made by the Contractor, to determine these field variations from the dimensions shown on the drawings. All shop fabrication must take into account these dimensional field variations to ascertain correct fit.

2.2. FIT

Fabrication shall provide adequate allowance for installation trim and fit.

2.3. PENETRATIONS

Fabrication shall provide a loose flange or field weld for each pipe length, which penetrates a floor, wall or roof.

3. INSTALLATION

3.1. WELDED JOINTS

Welded connections shall conform to standards listed in paragraph 1.3, above.

3.2. PIPE THREADING

Straight threaded connections to thin wall pipe of less than 2 inch size shall be made with Schedule 40S nipples minimum, one end threaded and one end butt welded onto the thin wall pipe. All threaded joints shall be in Schedule 40S or thicker pipe. Threading in field shall be held to a minimum. If unavoidable, it shall be done in the following manner:

3.2.1. *Use a threading machine* that has been thoroughly cleaned, and with the lubricant pump and screen in good working order. Use a heavy sulfur base threading oil.

3.2.2. *Use high speed dies* in new condition in a self-opening expanded die head.

3.2.3. *A cutting speed* of 15 feet per minute is recommended. Flush the work off continuously with threading oil.

3.2.4. *Cut threads* to length exactly equal to width of die.

3.2.5. *Wash threads* clean with solvent to remove any cutting oil or grease before applying thread sealants specified in the piping material and gasket and thread sealant sections.

3.2.6. *Whenever Teflon* thread tape is used, the wrapping shall start approximately two threads from the end of the pipe.

3.2.7. Apply Teflon tape so that it will tighten when the joint is threaded together.

3.2.8. *Whenever Teflon* taped joints are broken, all traces of the old tape shall be removed before applying new tape and reassembling the joint.

3.3. FLANGED CONNECTIONS

Stub end rings shall be installed with faces perpendicular to the centerline of pipe. This is of the utmost importance to obtain maximum sealing for the joint. Any stub end connections which are found to be skewed to the pipe center line shall be rejected and corrective measures shall be taken as required to obtain the correct facing and right angularity. The weld between the angle face ring and the piping wall must be welded in accordance with TD-030-101. Flange bolts, when tightened shall expose two threads (minimum) past the nut. Instrument orifice plate flange connections shall have all weld spatter removed, and have the inside of welds ground smooth. Flange bolt holes shall straddle pipe centerline.

3.4. TERMINAL POINTS

Pipe connecting to equipment shall be fully examined before and after attachment to assure that minimal forces are place on the equipment. Nozzle loads for rotating equipment shall meet API, NEMA or manufacturer requirements.

3.5. VALVE ORIENTATION

Unless otherwise specified, valves 2 inches and smaller in vertical lines shall have the handwheel located at right angle to centerline of header.

3.6. LABELING

Pipe labeling is used to identify the contents of pipes, to denote pressure and temperature hazards as a part of the legend when appropriate, and to indicate direction of flow.

Color coding is used to identify the characteristic hazard or physical properties of the pipe contents. It also denotes the use or function of the piping system in the case of fire protection piping.

Labels indicating line contents and direction of flow shall be furnish and installed by the contractor for all aboveground piping following the application of final coating or insulation and lagging. All pipe labels shall conform to, and be installed in accordance with ASME A13.1.

4. BRANCH CONNECTIONS

4.1. EXCLUSIONS

Heavy wall stainless steel pipe (Schedule 40S, 80S, and heavier) is excluded from this paragraph. Branch connections for heavy wall stainless steel pipe shall be designed as specified in paragraph 1.2.2, above.

4.2. FITTINGS

The individual material specifications specify the fittings required to make a branch connection.

4.3. NOZZLE WELDS

Branch connections in thin wall stainless steel pipe for branches 21/2 inches and larger in headers 3 inches and larger may be made by fabricated tees with extruded outlets or by reinforced nozzle welds. Tees with extruded outlets do not require reinforcement. All nozzle welds shall be reinforced in accordance with TD-030-073. Where the branch is the same size as the header, tees shall be used.

4.4. COUPLINGS

Threaded full couplings may be used for branch connections, provided the nominal diameter of the branch does not exceed 2 inch nominal pipe size or ¼ the nominal diameter of the header, whichever is less; and the effective wall thickness of the coupling is not less than ASME Class 2000. All couplings shall be welded directly to the header and shall be reinforced in accordance with TD-030-073.

5. TOOLS AND EQUIPMENT

Stainless steel contacted or worked with carbon steel materials or tools will rust. To minimize contact with ferrous particles, only non-ferrous chisels, peen hammers, files, and wire brushes shall be used. Grinding wheels and cut off wheels shall be new or shall have been used solely on stainless steel. All tools for use with stainless steel shall be marked “Stainless Steel.”

6. SHIPPING AND STORAGE

Fabricated pipe sections being stored or shipped shall have wooden plugs securely installed in each end, except for ends with angle face rings, in order to prevent the pipe ends from being banged or bent out of round. Fabricated pipe sections shall be stored and protected in manner that will prevent them from being damaged.

END OF DOCUMENT

Piping Specification

Title:	**Examination, Cleaning and Testing**		
Project Doc. No.:	**SS-030-031**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	15Apr21	Standard		CKF	TCS	

1. GENERAL

1.1. SCOPE

This specification covers standard examination, cleaning and testing procedures used for steam, hydraulic, process and utility piping systems. Fluid systems requiring specialized cleaning and testing are addressed in separate sections of the specification.

1.2. CODES AND STANDARDS

The method, degree and acceptance standards for examination, cleaning and testing shall be determined by the applicable codes and this specification unless specified otherwise by the owner. Where applicable codes require the examination, cleaning and testing to be performed in the presence of an authority having jurisdiction over the work, the contractor shall determine the authorities having jurisdiction, notify them of the event in advance and obtain the written approval of such authority. The contractor shall notify the owner or owner's representative in writing regarding the date of each test and the procedures to be used.

1.3. RECORDS

1.3.1. *Complete Test Records* shall keep by the contactor of tests performed on all piping systems. As a minimum records shall include:

- Date of test
- System identification
- Test Fluid
- Test Pressure
- Certification of results by examiner

1.3.2. *Complete Examination Records* shall be kept by the contractor of all Nondestructive Examination procedures and their results, for all piping systems. A record shall be kept of the relative position of welds on an isometric or orthographic weld map.

1.4. SUBMITTALS

A procedure for the test methods, schedules, test media source, quality and disposal method shall be submitted to the owner or owner's representative prior to flushing or testing.

1.5. PERSONNEL

All personnel performing nondestructive examination shall be qualified and certified in accordance with the organization authorized under the applicable Piping Code.

2. EXAMINATION

Examination applies to quality control functions performed by the manufacturer (for components only), fabricator, or erector. The method, extent and acceptance criteria for examination shall be determined by the applicable code and this specification. The contractor is required to obtain owner approval before substitution of any alternate examination method permitted by the Code. All examination methods shall be in accordance with ASME B&PVC Section V and the applicable ASME Piping Code.

2.1. VISUAL EXAMINATION (**VT**)

2.1.1. *Visual Examination* shall be performed in accordance with ASME B&PVC, Section V, Article 1, T-120 (e) or (f) and the applicable Piping Code.

2.1.2. *Visual Examination Personnel* shall have an annual vision test to assure natural or corrected near distance vision ability to read standard J-1 letters on standard Jaeger test type charts for near vision.

2.1.3. *A Visual Examination* is the observation of whatever portions of components, joints, and other piping elements that are exposed to such observation before, during or after manufacturer, fabrication, assembly, erection, inspection or testing. This may include verification of the applicable requirements for materials, components, dimensions, joint preparation, alignment, welding or joining, supports, assembly and erection. Examination may be direct or indirect.

2.2. RADIOGRAPHIC EXAMINATION (**RT**)

Radiographic Examination shall be performed in accordance with ASME B&PVC, Section V, Article 2 and the applicable Piping Code.

2.3. ULTRASONIC EXAMINATION (**UT**)

Ultrasonic Examination shall be performed in accordance with ASME B&PVC, Section V, Article 4 and the applicable Piping Code.

2.4. MAGNETIC PARTICLE EXAMINATION (**MT**)

Magnetic Particle Examination shall be performed in accordance with ASME B&PVC, Section V, Article 7 and the applicable Piping Code.

2.5. LIQUID PENETRANT EXAMINATION (**PT**)

Liquid Penetrant Examination shall be performed in accordance with ASME B&PVC, Section V, Article 6 and the applicable Piping Code.

2.6. EXAMINATION CATEGORIES

The following categories shall be used as reference, for the method and extent of examination required for each fluid service. The categories are based upon ASME B31.1 and B31.3 requirements. Acceptance criteria shall be in accordance with the applicable Code. In cases of disagreement, the applicable Code shall prevail.

Title:	**Examination, Cleaning and Testing**		
Project Doc. No.:	**SS-030-031**	Revision No.:	**0**

CATEGORY	ASME CODE	METHOD AND EXTENT
E1A	B31.1 (>750°F) (All Pressures)	100% VT for welds, fabrication and erection 100% RT/UT for circumferential and longitudinal butt welds over NPS 2 and welded branch connections over NPS 4 100% MT/PT for socket welds and all others
E1B	B31.1 (350°F-750°F) (>1025 psig)	100% RT/UT for circumferential and longitudinal butt welds thickness > ¾" over NPS 2 and welded branch connection thickness > ¾" over NPS 4 100% MT/PT for welded branch connection thickness > ¾", NPS 4 and less 100% VT for all others
E1C	B31.1 Remainder (All Sizes and Thickness)	100% VT for all weld, fabrication, joints and erection
E3D	B31.3 Category D	20% Random VT (sample each operator)
E3N	B31.3 Normal Fluid	5% Random VT for fabrication, joints and erection 100% VT for joints where pneumatic testing is approved. 5% Random RT/UT for circumferential and miter groove welds (sample each operator)
E3M	B31.3 Category M	VT for 100% fabrication, joints and erection 20% Random RT for circumferential welds and welded branch connections 20% Random MT for Socketwelds
E3H	B31.3 High Pressure	100% VT for welds, fabrication and erection 100% RT for circumferential and longitudinal butt welds and welded branch connections
E3S	B31.3 Severe Cyclic	100% VT for fabrication, joints and erection 100% RT/UT for circumferential and branch connection welds. 100% MT for socket welds

FIG. 2.0

3. CLEANING

3.1. INSPECTION and ISOLATION

3.1.1. *Valves and Flow Instruments*. The following pieces of equipment shall be left out during erection and replaced by temporary spool pieces before cleaning:

- Flow nozzles and lined magnetic flow meters;

- All control valves *except* butterfly valves 6 inches and larger and V-Ball valves 4 inches and larger.

3.1.2. *Miscellaneous Components*. The following pieces of equipment shall either be left out during erection or removed from pipelines before cleaning:

- Orifice plates
- Internal parts of consistency regulators
- Desuperheater nozzles
- Rupture discs
- Spray nozzles
- Temperature elements

3.1.3. *Isolation*. The following pieces of equipment shall be blanked-off or isolated before cleaning:

- Safety relief valves
- Instrument connections
- Equipment inlets and outlets

3.1.4. *Checking Other Equipment*. All other equipment not specifically listed above shall be inspected and, if liable to damage by cleaning and/or by the test pressure, shall be isolated.

3.2. SCREENS

Temporary screens fabricated from ¼ inch x ¼ inch mesh, 22 gauge wire cloth shall be provided by the piping contractor and inserted in the suction of all pumps. For pumps which are equipped with permanent strainers, the temporary strainer shall be inserted upstream of the permanent strainer. The cloth or other part of the screen shall extend outside of the flange so that its presence can be detected without breaking the connection. Screens are to be removed by the contractor after testing and flushing operations have been completed. When screens are removed, new gaskets must be used. Gaskets, which have been “grooved” by the screen, shall not be reused. Special strainer requirements will be indicated on the piping drawings.

3.3. TEMPORARY CONNECTIONS

The piping contractor shall provide temporary connections and any temporary piping required for flushing, as shown on the drawings, or as directed by the owner or owner’s representative. All temporary connections and lines shall be removed after flushing and the piping system left ready for testing. Temporary high point vents or vacuum breakers shall be located and installed by the contractor. Pressure gauges shall be installed and calibrated to monitor pressure and leakdown.

3.4. FLUSHING AND TEST MEDIA

3.4.1. *Water* shall be clean and of such quality as to minimize corrosion of piping materials. Potable water shall be used for potable water service or other applications, where bacteria growth is a hazard. Distilled/deionized water may be required for high purity or sanitary applications. Water for use with austenitic stainless steels shall have a minimum 1% sodium carbonate by volume and a maximum chloride content of 50 ppm for stainless steels. Temperature for all water shall be that of the available source unless specified by the owner. Test pressure shall not be applied

until the system and medium are approximately the same temperature. The possibility of brittle fracture shall be considered when conducting leak tests at low temperatures. Disposal of all test media shall be in full compliance with all state, local and national regulations and in accordance with the owner's guidelines.

3.4.2. *Flushing Oil* shall be in accordance with ASTM D 4174.

3.4.3. *Air or Inert Gas* shall be from a clean, oil free source. Air for fluid systems sensitive to moisture shall be clean, oil free, dry air having a dew point of -40°F or below.

3.4.4. *Steam* shall be furnished from the plant steam supply, which has been properly trapped to ensure no moisture carry over.

3.5. FLUSHING PROCEDURE

3.5.1. Fluid shall be introduced into the piping system with sufficient volume and velocity to fill the system and dislodge any rust, scale, dirt or debris present from fabrication and erection. Flow shall continue until the pipeline is discharging a clean fluid. To further verify cleanliness, the system shall be visually inspected at two to six points selected by the inspector. The system shall be considered clean when such foreign matter as scale, rust, metal shavings and sand are not visible to the eye and grittiness is not detectable to the touch. When pipelines are flushed into a vessel, the vessel shall be drained, cleaned and inspected by the owner or owner's representative upon completion of the flushing. If such vessels are to be used as a source of supply for flushing other pipelines, the cleaning and inspection of the vessel shall be completed before such use.

3.6. FLUSHING VELOCITY

3.6.1. Utility systems flushed with water shall utilize a velocity, which is greater of 1½ times the normal operating velocity or 10 ft/sec.

3.6.2. Process piping systems flushed with water shall utilize a velocity, which is the greater of 1½ times the normal operating velocity or 23 ft/sec.

3.6.3. If stated velocity is not achievable, retrojetting or similar method shall be used.

3.7. AIR BLOWING PROCEDURE

3.7.1. Air supply lines and headers shall be blown with air from the supply air compressors or nitrogen from a compressor or bottled source. Instrument air supply lines and headers shall be blown with clean, dry, oil free air from the instrument air compressor only, and from no other source. Lines shall be blown until in the opinion of the owner or owner's representative, the discharge is entirely free from dust and debris.

3.8. AIR BLOWING VELOCITY

All Systems Flushed with Air shall utilize a velocity not less than 66 ft/sec.

3.9. STEAM BLOWDOWN

Steam for steam blowdown shall be furnished from the plant steam supply, unless otherwise specified. The principal behind steam blowing lines clean is that the thermal cycling and high gas velocity will shock the pipe, breaking the mill scale and weld slag away from the pipe wall. Ideally, to obtain optimum cleaning, the blow should take place prior to the system being insulated to maximize thermal cycling. If the system is insulated, a greater time between blows

may be necessary to allow the system to cool. Steam lines and other lines that are to be steam blown shall be blown in the following manner and sequence.

3.10. BLOWDOWN PREPARATION

3.10.1. Insure that all lines have been examined, inspected, hydrotested and that all heat treatment is complete prior to blowdown.

3.10.2. Check that all spring hanger blocks are removed and that the cold load spring settings are in accordance with the drawings or Spring Hanger Data Sheets.

3.10.3. Install temporary atmospheric vent piping, blowdown valve and supports. Route the vent to provide safe discharge of live steam to the atmosphere. Anchor and guide all permanent and temporary piping with sufficient flexibility for thermal expansion and sufficient strength for thrust loading. The installation shall be checked and approved by the owner or owner's representative before commencing a steam blow. The temporary vent shall be sized by the engineer to provide the proper mass-velocity head to ensure proper cleaning.

3.10.4. Steam blowdown produces noise levels in excess of those determined safe for humans. Double ear protection shall be used by personnel in the immediate area and precautions shall be taken to protect personnel within the surrounding area.

3.10.5. Close the shut-off valves to steam trap assemblies.

3.10.6. Prepare steel target bars, polished to a mirror finish, for attachment to the open end of the vent pipe. Install them during the final blows. The quantity, size and depth of impingement will be used to determine pipe cleanliness.

3.10.7. Adequate radio communication shall be established and maintained between the steam plant operator and field personnel. A backup visual communication system consisting of lights, flags or hand signals is recommended.

3.11. BLOWDOWN OPERATION

3.11.1. Heat the pipe system slowly to operating temperature and while the pipe or system is being heated, check that all expansion joints are working, that all expansion shoes and roller saddles are of the proper length and that floor and wall-opening clearances are adequate.

3.11.2. As the pipe is being heated, open all pipeline drains and slag pocket drains and clean them if necessary.

3.11.3. Blow the lines for about 15 minutes at a sufficient velocity to loosen and remove dirt and scale.

3.11.4. Cool the pipe gradually over a period of 30 minutes to atmospheric temperature.

3.11.5. Repeat steps described above, at least 4 times or until in the opinion of the owner's representative the pipes are clean as measured by a polished steel bar stock or coupon to a maximum impingement pattern determined by the steam operating equipment vendor or plant owner.

3.11.6. If any pipelines or vessels are flushed or blown into a pipeline or system that has been previously cleaned, the pipeline or system shall be recleaned.

3.11.7. Drain all temporary and permanent piping. Remove all temporary connections and install all valves, equipment and instrumentation using new gaskets.

3.12. HYDRAULIC AND LUBRICATION SYSTEM CLEANING AND FLUSHING

3.13. PIPE MATERIAL

All lube and hydraulic systems must be fabricated from pickled pipe or tubing (see applicable specifications) and thoroughly flushed before being put into service. Factory pickled pipe as specified in piping materials shall be used.

3.14. FLUSHING

All hydraulic systems shall be flushed and cleaned in accordance with ASTM D4174 “Standard Practice for Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems”. The owner may require special cleaning procedures, which require the services of a specialty contractor. For turbine lubrication systems refer to ASTM D6439 “Standard Guide for Cleaning, Flushing and Purification of Steam, Gas and Hydroelectric Turbine Lubrication Systems” and the manufacturer’s guidelines.

3.15. CLEANING OF FLAMMABLE GAS PIPING

3.15.1. All flammable gas piping shall be cleaned and purged in accordance with NFPA 56 “Standard for Fire and Explosion Prevention During Cleaning and Purging of Flammable Gas Piping Systems”.

3.16. CLEANING OF AUSTINETIC STAINLESS STEEL PIPE

3.16.1. All prefabricated, austenitic, stainless steel pipe shall be delivered to the site cleaned, pickled and passivated in accordance with ASTM A380.

3.16.2. Field fabricated pipe shall be flushed with a chloride free commercial degreaser prior to pickling of the welds. Bright annealed, pickled or polished pipe is not required to be field pickled. Field welds shall be treated as described below.

3.17. PIPE WELDS

3.17.1. Welds made on stainless steel result in heat tint at the heat-affected zone characterized by a chromium-depleted layer. These oxide layers do not have the same corrosion resistance as the parent metal. In order to obtain the full localized resistance of stainless steels, any oxides, tarnish and scale must be removed. The most effective means of removal are mechanical cleaning followed by a chemical passivation or pickling. A passive layer is spontaneously formed after pickling, once the surface is exposed to air.

4. LEAK TESTING

The testing method shall be determined by the applicable code and this specification. The contractor is required to obtain owner approval prior to the substitution of alternate test methods permitted by the code.

4.1. TEST PREPARATION

All examination, repairs, re-examination and post weld heat treatment shall be performed and accepted before cleaning and testing procedures begin. No test shall be conducted by the contractor without the presence of the owner or owner’s representative or one of the contractor’s supervisors approved by the owner’s representative. No test connections shall be left attached to the systems unattended, particularly at the end of the test or the end of the work shift. The owner’s representative will sign the test record after satisfactory completion of test.

4.2. INSPECTION

4.2.1. *All joints and equipment connections* shall be checked for misalignment, loose or missing flange bolts or gaskets before flushing or applying test pressure. Check for adequate high point vents or vacuum breakers.

4.2.2. *All joints, including welds* shall be left uninsulated and exposed for examination during leak testing. Joints not requiring a sensitive leak test may be primed and painted.

4.2.3. *Pipe supports* shall be reviewed to determine their capability to support hydrostatic loads. This is especially important for gas and vapor lines not intended to carry water. Check rod sizes for capacity.

4.2.4. *Spring Hangers* must be blocked or temporary supports constructed to support the load.

4.2.5. *Expansion Joints* shall be temporarily stayed to prevent any load or movement and support for the bellows shall be considered for joints designed for gas service. In no case shall a bellows type joint be subjected to a test pressure greater than 150% of the design or pressure greater than the manufacturer's test pressure.

4.3. ISOLATION

4.3.1. *Tanks and Vessels*. No tank or other vessel, to which a pipe system to be tested is connected, shall be subjected to the test pressure unless it has been definitely established that the tank or vessel is designed for a pressure equal to or greater than the test pressure.

5. HYDROSTATIC LEAK TEST (HLT)

5.1. EXCEPTIONS

Prior to initial operation and upon completion of all required examinations, all piping systems shall receive a hydrostatic pressure test with the following exceptions:

- Where the owner specifies an initial service leak test of low pressure, low temperature innocuous fluids. (B31.3 Category D)
- Where introduction of water into a system would damage linings or internal insulation or contaminate a process, which would be hazardous, corrosive or inoperative in the presence of moisture, a pneumatic leak test may be specified by the owner.
- Where the owner considers a hydrostatic leak test impractical or impossible, a pneumatic leak test may be specified by the owner.

5.2. PRESSURE

The Hydrostatic Test Pressure shall be 1½ times the *System Design Pressure*. Test pressure for lines designated as ASME B31.3 compliant shall be adjusted in accordance with para. 345.4.2 when the fluid design temperature exceeds the test fluid temperature. Piping subjected to external pressure shall be tested at an internal gauge pressure 1½ times the external differential pressure, but not less than 15 psi. For Jacketed piping systems, the core pipe shall be tested on the basis of the internal or external design pressure, whichever is critical. The core test must be performed before the jacket is complete. The jacket shall be leak tested at 1½ times the jacket design pressure unless specified otherwise.

5.3. TEMPERATURE

The possibility of brittle fracture shall be considered when conducting leak tests at low temperatures. Precautions shall be taken where the test medium is subjected to thermal expansion due to large ambient temperature swings during testing.

5.4. DURATION and ACCEPTANCE

Test Pressure shall be continuously maintained for a minimum of 10 minutes and for such additional time as may be required to conduct inspection for leaks. The piping system shall show no visual evidence of weeping or leaking.

6. PNEUMATIC LEAK TEST (PLT)

6.1. PRECAUTIONS

6.1.1. Pneumatic leak testing involves the hazard of released energy stored in compressed gas. Particular care must be taken to minimize the chance of brittle failure due to low temperature during testing. Brittle materials (eg., cast iron, ductile iron) shall not be pneumatically tested.

6.1.2. No unauthorized personnel shall be allowed in the vicinity during testing.

6.2. PRESSURE

Lines not subjected to a hydrostatic test or initial service test shall be tested with air or nitrogen at 1.1 or 1.2 to 1.5 times the *System Design Pressure*, depending on Code requirements.

6.3. PROCEDURE

Pressurize the system to 25 psig. This is required to provide a preliminary safety check of the system. The pressure shall be increased gradually in 25 psi increments pausing for 10 minutes at each step to allow sufficient time for piping to equalize strains. Test pressure shall be held for a minimum of 10 minutes. It shall then be reduced to the lesser of design pressure or 100 psig and held for such additional time as may be required to conduct inspection for leaks

6.4. BUBBLE TEST

6.4.1. In addition to the pneumatic test, a bubble test shall be performed on all joints for flammable gas service to detect leaks.

6.4.2. Joints shall be tested for leaks with a commercially available test solution, such as Swagelok “Snoop”. Bubble formation properties of the solution shall be periodically checked.

6.5. SENSITIVE LEAK TEST (SLT)

When specified, additional testing methods such as helium mass-spectrometer or halide tests, having a greater degree of sensitivity shall accompany the pneumatic test. This applies to all fluids designated as ASME B31.3 Category M and others as noted.

7. INITIAL SERVICE TEST (IST)

During an Initial Service Test, the line shall be filled with service fluid, gradually brought up to operating pressure and continually held for a minimum of 10 minutes. The line shall be inspected and show no visible signs of weeping or leaking. Not applicable to Boiler External Piping.

8. POST-TEST CLEANING

8.1. DRAINING

8.1.1. Drain all permanent and temporary lines of test fluid in accordance with the owner's guidelines and in full compliance with all state and local regulations. Remove all items used solely for accomplishing the testing. At the finish of the test the piping systems shall be left in a condition ready for operation.

8.1.2. Prompt removal of stagnant water after hydrotesting requires particular attention. It is very important to drain and dry stainless steels systems after hydrotesting if not going into service directly. If this is not possible, maintaining regular flushing or water recirculation is required to prevent microbiologically influenced corrosion (MIC).

8.2. DRYING

When required for service, thoroughly dry all lines by purging with commercial nitrogen or dry, filtered air. Moisture sensitive paper shall be used to confirm dryness. Seal and charge with nitrogen until commissioned.

8.3. DISINFECTING

Potable water lines shall be disinfected in accordance with AWWA C651 "Disinfecting Water Mains".

8.4. SPECIAL SERVICES

Refer to the specifications for fluid services requiring special methods of post-test preparation and cleaning.

END OF DOCUMENT

Title:	**Piping Material Specifications**	
Project Doc. No.:	**SS-030-100**	Revision No.:

The Identification Codes shown in (RED in Brackets) on the Service Index, Piping Material Specifications and Valve Specifications of this document are in accordance with Wood P&ID Legend Sheet 143993-03-100. These Identification Codes shall be used for the Pipeline List, Valve List and P&ID.

Wood equivalent Identification Codes shown in this document are used for Piping Isometrics.

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	C2G (HBD) (JBD)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0.062"	150 PSIG @ -20 to 100ºF 150 PSIG @ 300º F	PRESSURE CLASS:	Special Class	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ – 2	Black Carbon Steel	A106 Gr B or A53 Gr B	Seamless	Schedule 80	Plain End	B36.10M	
	2½ - 24	Black Carbon Steel	A53 Grade B	ERW	Standard Weight	Butt Weld	B36.10M	17
	30	Black Carbon Steel	A53 Grade B or API 5L Grade B	ERW	Standard Weight	Butt Weld	B36.10M	17
NIPPLE	½ – 2	Black Carbon Steel	A106 Grade B	Seamless	Schedule 80	Threaded	ASTM A733	
	½ – 2	Black Carbon Steel	A106 Grade B	Seamless	Schedule 80	PE x TE	ASTM A733	
FITTING								
90º Ell, 45º Ell, Cap, Plug, Tee, Cross	½ – 2	Carbon Steel	A105	Forged	Class 3000	Socket Weld	B16.11, SP-95	
Plug	½ – 2	Carbon Steel	A105	Forged	Class 3000	Threaded	B16.11, B1.20.1	
Reducing Inserts	½ – 2	Carbon Steel	A105	Forged	Class 3000	Socket Weld	SP-79	
Elbolet, Laterolet, Sockolet	½ – 2	Carbon Steel	A105	Forged	Class 3000	Socket Weld	SP-97	
Elbolet, Latrolet, Thredolet	½ – 2	Carbon Steel	A105	Forged	Class 3000	Threaded	SP-97, B1.20.1	
Coupling, Red Coupling	½ – 2	Carbon Steel	A105	Forged	Class 3000	Socket Weld	B16.11	
	½ – 2	Carbon Steel	A105	Forged	Class 3000	Threaded	B16.11, B1.20.1	
Swaged Nipples	¾ – 4	Carbon Steel	A234 Grade WPB	Wrought	See Pipe	BW x PE	B16.9, SP-95	
90º Ell, 45º Ell,Tee, Reducer, Cap,	2½ -30	Carbon Steel	A234 Grade WPB	Wrought	Standard Weight	Butt Weld	B16.9	17
Elbolet, Latrolet, Weldolet	2½ -24	Carbon Steel	A105	Forged	Standard Weight	Butt Weld	SP-97	
UNION	½ – 2	Carbon Steel	A105	Forged	Class 3000	Socket Weld	SP-83	12
FLANGE								
Socket Weld	½ – 2	Carbon Steel	A105	Forged	Class 150	Raised Face	B16.5	5
Slip-on	2½ -24	Carbon Steel	A105	Forged	Class 150	Raised Face	B16.5	4,124
Welding Neck	2½ -24	Carbon Steel	A105	Forged	Class 150	Raised Face	B16.5	5,124
Slip-on, Hub Type	10 - 30	Carbon Steel	A105 or A516 Grade 70	Forged or Plate	Class D	Flat Face	AWWA C207	1, 5, 23
Blind	½ – 24	Carbon Steel	A105	Forged	Class 150	Raised Face	B16.5	
GASKET	ALL	Non Asbestos Fiber	Garlock 3400 Garlock 3000		Class 150 ⅛" Thick	Flat Ring or Full Face	B16.21	119
BOLT	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Carbon Steel	A194 Grade 2/2H	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	

PIPING MATERIAL SPECIFICATION

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APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0.062"	150 PSIG @ -20 to 100ºF 150 PSIG @ 300º F	PRESSURE CLASS:	Special Class	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
SPEC BLIND	½ - 30	Carbon Steel	A516 Grade 70 Norm	Plate	Class 150	Raised Face	B16.48, B46.1	
BLEED RING	½ - 24	Carbon Steel	A516 Grade 70 Norm	Plate	Class 150	Raised Face	B16.5, B46.1	

BRANCH CONNECTIONS		
HEADER SIZE	½ – 2	All Branches Use Tees or Reducing Tees. Reducing Inserts May Be Used.
HEADER SIZE	2½– 30	Branches ½" – 2" Use Sockolets. Branches 2½"-30" Use Tees or Reducing Tees in accordance with ASME B16.9. All Others Use Weldolets.

NOTES	REFERENCE SPECIFICATIONS
1) Use flat face flange with full face gasket when mating with cast iron Class 125 flange. 4) Slip-on flange fillet welds shall be made on both inside and outside of the flange. 5) Welding neck and socket weld flange and butt weld valve bore shall match the pipe I.D. 8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve. 13) All Carbon and Alloy Steel lines 3" and larger and 250°F and hotter and Austenitic Stainless Steel lines 3" and larger and 200°F and hotter shall be reviewed for stress analysis. 12) Unions shall have stainless steel to steel ground joints. 14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 17) Butt weld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted. 23) Specification limited by flange ratings. 65) Underground piping shall be coated and wrapped in accordance with AWWA C203 and cathodically protected in accordance with NACE SP0169 119) Use Garlock 3000 for hydrocarbon service 124) Use weld neck flanges when joining to butt weld pipe fittings. Use slip-on flanges for others.	SS-030-002 SS-030-010 SS-030-011 SS-030-020 SS-030-031

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	08Mar18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		**PROJECT NO:**	**245891**	**MATERIAL IDENTIFICATION:**	**F3A (HZD) (JZD)**	
APPROVED	TCS	DATE:	08Mar18							
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 180ºF or Full Vacuum @ 175ºF (Note 204)	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	**SS-030-100**	REV **0**
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ASTM/ASME/MSS	NOTES
PIPE	1 – 12	Fiberglass (RTRP) Vinyl Ester Resin	D2310 RTRP – 12E 110 mil Corrosion /Erosion Barrier	Filament-Wound	150 psig,	Tapered Bell & Spigot, Plain End, Flanged	D2996 D3567	74,75,77
PIPE	14 – 24	Fiberglass (RTRP) Vinyl Ester Resin	D2310 RTRP – 12E 110 mil Corrosion /Erosion Barrier	Filament-Wound	150 psig,	Plain End for Butt and Strap, Flanged	D2996 D3567	74,75,77
FITTING								
90º Ell, 45º Ell, Tee, Lateral, Cross, Stubend, Saddle, Reducer, Cap	1 – 12	Fiberglass (RTRP) Vinyl Ester Resin	D5685 52E 110 mil Corrosion /Erosion Barrier	Contact Molded	150 psig	Tapered Bell & Spigot, Plain End, Flanged	D5685 52E1D D3567	74,75,77
90º Ell, 45º Ell, Tee, Lateral, Cross, Stubend, Reducer	14 – 24	Fiberglass (RTRP) Vinyl Ester Resin	D5685 52E D5685 12E 110 mil Corrosion /Erosion Barrier	Contact Molded or Filament-Wound	150 psig	Plain End for Butt and Strap	D5685 52E4D D5685 12E4D D3567	74,75,77
Coupling, Nipple	1 – 12	Fiberglass (RTRP) Vinyl Ester Resin	D5685 52E 110 mil Corrosion /Erosion Barrier	Filament-Wound	150 psig	Tapered Bell & Spigot	D5685 52E1D D5685 12E4D D3567	74,75,77
Thrust Collar	1 – 24	Fiberglass (RTRP) Vinyl Ester Resin	D2310 RTRP – 12E	Filament-Wound	N/A	N/A	D2996 D3567	74,75,77
FLANGE								
Attached to Pipe Section With Tapered Socket Joint or Plain End	1 – 24	Fiberglass (RTRP) Vinyl Ester Resin	D5685 52E D5685 12E 110 mil Corrosion /Erosion Barrier	Contact Molded or Filament-Wound	150 psig	Tapered Bell & Spigot, Plain End for Butt and Strap	D5685 52E4D D5685 12E4D D3567 B16.5, D5421, D4024	74,75,76, 77,99
Steel Backing Flange	1 - 24	Galv Carbon Steel	A36 or A516 Gr 70	Plate	150 psig		B16.5	
Blind	1 – 24	Fiberglass (RTRP) Vinyl Ester Resin	D5685 12B3C D5685 52B3C 110 mil Corrosion /Erosion Barrier	Contact Molded or Filament-Wound	150psig	Flat Face	D5685 12B3C D5685 52B3C D3567, B16.5, D5421	74,75,76, 77, 99

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	08Mar18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	F3A (HZD) (JZD)	
APPROVED	TCS	DATE:	08Mar18							
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 180ºF or Full Vacuum @ 175ºF (Note 204)	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	SS-030-100	REV 0
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ASTM/ASME/MSS	NOTES
JOINT		Supplied by Pipe and Fitting Mfg				Tapered Bell & Spigot, Flanged ,Butt and Strap	NBS PS 15 69 Mfg Std	
SPECTACLE BLIND	½ - 24	Super Austenitic SS	B688 N08356	Plate	Class 150	Flat Ring	B16.48	
SPECTACLE BLIND	8 - 12	Super Austenitic SS	B688 N08356	Plate	1/4” Thick	Flat Ring	B16.48	210, 211
GASKET	ALL	Neoprene	Garlock 7986		1/8” Thick	Full Face	B16.21	99
BOLT	All	Stainless Steel	A193 Gr B8 Class 2	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Stainless Steel	A193 Gr B8 Class 2	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Stainless Steel	A194 Grade 8	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
WASHER	All	Stainless Steel	ASA 316SS Hardened	Wrought		Flat	B18.22.1	

TABLE I

PIPE WALL THICKNESS (in)			FLANGE DIMENSIONS (in)			
Size (I.D.)	CORROSION BARRIER	TOTAL WALL THICKNESS	FLANGE O.D.	BOLT CIRCLE	FLANGE THICKNESS	FLANGE LENGTH
1	0.11	0.19	4.25	3.13	0.88	6
1½	0.11	0.19	5.00	3.88	0.88	6
2	0.11	0.19	6.00	4.75	0.88	6
3	0.11	0.19	7.50	6.00	0.88	6
4	0.11	0.20	9.00	7.50	0.94	6
6	0.11	0.24	11.00	9.50	1.06	8
8	0.11	0.28	13.75	11.75	1.25	8
10	0.11	0.32	16.25	14.25	1.44	10
12	0.11	0.37	19.25	17.00	1.75	10
14	0.11	0.41	21.00	18.75	1.88	12
16	0.11	0.45	23.50	21.25	2.25	12

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	08Mar18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		**PROJECT NO:**	**245891**	**MATERIAL IDENTIFICATION:**	**F3A (HZD) (JZD)**	
APPROVED	TCS	DATE:	08Mar18							
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 180ºF or Full Vacuum @ 175ºF (Note 204)	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	**SS-030-100**	REV **0**
ISSUED:		DATE:								

18	0.11	0.49	25.00	22.75	2.25	14
20	0.11	0.54	27.50	25.00	2.38	14
24	0.11	0.62	32.00	29.50	2.75	16

BRANCH CONNECTIONS		
HEADER SIZE	1 - 24	All Branches Use Tees or Reducing Tees where commercially available or Reducing Saddles for others. Small Stub in nozzles on large pipe shall be radiused, reinforced and gusseted.

NOTES	**REFERENCE SPECIFICATIONS**
14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 74) Pipe and fittings shall be RPS/ABCO A-150 or approved equal. 75) Corrosion/Erosion Barrier shall not be considered in the structural calculations for wall thickness. 76) Use Lap-Joint Stub End with Steel back-up flange for mating with steel raised face flange. 77) Erosion Corrosion barrier resin shall contain 50% $Al2O_3$ min, with a min wear index of 45 in accordance with ASTM D4060. 99) Use flat face flange with full face gasket when mating with FRP flange or other flat face flanges. Use flat face flange with steel back-up ring when bolting to expansion joints with tie-rods 204) Full vacuum rating is only required for specific pipelines. See line list for pipe requiring full vacuum rating. 206) Installation, joining and support shall be in accordance with the manufacturer guidelines.	SS-030-001 SS-030-002 SS-030-031

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	N2C (HAD) (JAD)	
APPROVED	TCS	DATE:	07Dec18							
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0.00"	285 PSIG @ -20 to 100ºF 170 PSIG @ 500º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	SS-030-100	REV 0
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ - 2	Nickel Alloy Hastelloy C276	B619 N10276 B622 N10276	Welded Seamless	Sch 40S	PE or TE	B36.19M	8
	2½– 24	Nickel Alloy Hastelloy C276	B619 N10276 B622 N10276	Welded Seamless	Sch 10S	Bevel End	B36.19M	17
NIPPLE	½ - 2	Nickel Alloy Hastelloy C276	B619 N10276 B622 N10276	Welded Seamless	Sch 40S	TE x TE	B36.19M	8, 17
	½ - 2	Nickel Alloy Hastelloy C276	B619 N10276 B622 N10276	Welded Seamless	Sch 40S	PE x TE	B36.19M	8
FITTING								
90º Ell, 45º Ell, Lateral Cap, Plug, Tee, Cross	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Socket Weld	B16.11, SP-95	
Plug	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Threaded	B16.11	
Elbolet, Latrolet, Sockolet	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Socket Weld	SP-97	
Elbolet, Latrolet, Thredolet,	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Threaded	SP-97	8
Coupling, Red Coupling	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Thrd or SW	B16.11, B1.20.1	8
Reducing Insert	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Socket Weld	SP-79	
Swaged Nipples	¾ - 4	Nickel Alloy	B366 WPHC276 S	Wrought	See Pipe	BW x PE	B16.9, SP-95	17
90º Ell, 45º Ell, Tee, Reducer, Cap, Cross	2½ - 24	Nickel Alloy	B366 WPHC276 WX	Wrought	See Pipe	Butt Weld	B16.9	17
Stub End Type A	½ - 24	Nickel Alloy	B366 WPHC276 WX	Wrought	See Pipe	Butt Weld	B16.9, SP-43	17,15
Elbolet, Latrolet, Weldolet	½ - 20	Nickel Alloy	B564 N10276	Forged	See Pipe	Butt Weld	SP-97	
UNION	½ - 2	Nickel Alloy	B564 N10276	Forged	Class 3000	Socket Weld	SP-83	12
FLANGE	½ – 2	Nickel Alloy	B462 N10276	Forged	Class 150	Socket Weld	B16.5	5, 23
	2½– 24	Nickel Alloy	B462 N10276	Forged	Class 150	Weld Neck	B16.5	5,17
	½– 24	Galv Carbon Steel	A105	Forged	Class 150	Lap Joint	B16.5	45
	½ – 24	Nickel Alloy	B462 N10276	Forged	Class 150	Blind	B16.5	
	½ – 24	Carbon Steel w/Nickel Alloy Clad	A105 w/0.063" Clad B575 N10276	Forged	Class 150	Blind	B16.5	
GASKET	ALL	Restructured PTFE	Garlock 3510		1/8" Thick	Ring Type	B16.21	
SPEC BLIND	½ - 24	Nickel Alloy	B575 N10276	Plate	Class 150	Raised Face	B16.48, B46.1	
BLEED RING	½ - 24	Nickel Alloy	B575 N10276	Plate	Class 150	Raised Face	B16.5, B46.1	
BOLT	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	N2C (HAD) (JAD)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	20Jul21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0.00"	285 PSIG @ -20 to 100ºF 170 PSIG @ 500º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
NUT	All	Carbon Steel	A194 Grade 2/2H	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	

BRANCH CONNECTIONS		
HEADER SIZE	½ - 2	All Branches Use Tees or Reducing Tees. Reducing Inserts May Be Used.
HEADER SIZE	2½– 24	Branches ½" – 2" Use Sockolets. Branches 2½"-24" Use Tees or Reducing Tees in accordance with ASME B16.9. All Others Use Weldolets or Reinforced Nozzle Welds.

NOTES	REFERENCE SPECIFICATIONS
5) Welding neck and socket weld flange and butt weld valve bore shall match the pipe I.D.	SS-030-001
8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve.	SS-030-002
12) Unions shall have Alloy steel to steel ground joints.	SS-030-010
14) Bolt threads shall be coated with molybdenum disulfide before engaging.	SS-030-016
13) All Carbon and Alloy Steel lines 3" and larger and 250°F and hotter and Austenitic Alloy Steel lines 3" and larger and 200°F and hotter shall be reviewed to determine if a stress analysis is required.	SS-030-021
15) Use MSS length stub ends, unless noted otherwise.	SS-030-031
16) See Service Index for Valve, Gasket and Insulation codes.	33-030-033
17) Buttweld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted.	
23) Specification limited by flange ratings.	
45) Pipe and fittings shall be hot-dipped galvanized in accordance with ASTM A123.	
48) Nozzle Weld reinforcement shall be in accordance with Typical Detail SS-030-073.	

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	P8P (H_G)	
APPROVED	TCS	DATE:	07Dec18							
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	250 PSIG @ 100ºF See Table for Temp Derating	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	SS-030-100	REV 0
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574E PE4710	Extruded	See SDR Table	Butt Fusion	ASTM F714 ASTM D3035	51, 67, 68
FITTING								
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	2 – 12	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D3261 AWWA C906	50, 51, 68
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	14 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Fabricated	See SDR Table	Butt Fusion	ASTM D3261 AWWA C906	50, 68
Fusion Branch Saddle	2 – 8	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Socket Weld	ASTM D2467 AWWA C906	50, 68
Flange Adaptor	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D2467 AWWA C906	50, 68
FLANGE								
Backing Flange	2 – 36	Ductile Iron Galv.	A536 (65/45/12)	Cast	IPP Deltaflex See Table	RF Flange	B16.5 Drilling AWWA C906	
Blind Flange	2 - 36	Ductile Iron Galv.	A395	Cast	Class 150	FF Flange	B16.42	23
GASKET	ALL	Cloth Reinforced Red Rubber	A2000		1/8" Thick	Ring Type	B16.21	68
BOLT	All	Stainless Steel	A193/A320 B8M Cl 2	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Stainless Steel	A193/A320 B8M Cl 2	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Stainless Steel	A194 Grade 8M	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
WASHER	All	Stainless Steel	A540 B23 Hardened	Wrought		Flat	B18.22.1	

PRESSURE – TEMPERATURE - WALL THICKNESS

SDR	73°F (1.0)	90°F (.90)	100°F (.78)	110°F (.75)	120°F (.63)	130°F (.60)	140°F (.50)
7.3	320 PSIG	288 PSIG	250 PSIG	240 PSIG	202 PSIG	192 PSIG	160 PSIG
9.0	250 PSIG	225 PSIG	195 PSIG	187 PSIG	157 PSIG	150 PSIG	125 PSIG
11.0	200 PSIG	180 PSIG	156 PSIG	150 PSIG	126 PSIG	120 PSIG	100 PSIG
13.5	160 PSIG	144 PSIG	124 PSIG	120 PSIG	100 PSIG	96 PSIG	80 PSIG

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**P8P (H_G)**	
APPROVED	TCS	DATE:	07Dec18							
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	250 PSIG @ 100ºF See Table for Temp Derating	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	**SS-030-100**	REV **0**
ISSUED:		DATE:								

PRESSURE – TEMPERATURE - WALL THICKNESS							
SDR	**73°F (1.0)**	**90°F (.90)**	**100°F (.78)**	**110°F (.75)**	**120°F (.63)**	**130°F (.60)**	**140°F (.50)**
17.0	125 PSIG	112 PSIG	97 PSIG	93 PSIG	78 PSIG	75 PSIG	62 PSIG
21.0	100 PSIG	90 PSIG	78 PSIG	75 PSIG	63 PSIG	60 PSIG	50 PSIG
26.0	80 PSIG	72 PSIG	62 PSIG	60 PSIG	50 PSIG	48 PSIG	40 PSIG
32.5	63 PSIG	56 PSIG	49 PSIG	47 PSIG	39 PSIG	37 PSIG	31 PSIG

BRANCH CONNECTIONS		
HEADER SIZE	2 – 36	All Branches Use Tees or Reducing Tees. Reducing Branch Saddles May be used.

NOTES	REFERENCE SPECIFICATIONS
14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 23) Specification limited by flange ratings. 24) Specification limited by pipe wall thickness including manufacturing tolerance and corrosion allowance. 50) Fabricated fittings shall be produced in the SDR required to withstand the full pressure of the specified, adjoining pipe. 51) All pipe shall be fabricated and installed and butt fusion performed in accordance with the Plastic Pipe Institute. 67) Permanent identification shall be provided by co-extruding four equally spaced blue stripes along the pipe axis. 68) Pipe and Fittings shall be NSF-61 Listed.	SS-030-001 SS-030-002 SS-030-031

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**P8X (H_D)**	
APPROVED	TCS	DATE:	07Dec18							
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	See Table for Pressure / Temperature Rating	PRESSURE CLASS:		SPECIFICATION NUMBER:	**SS-030-100**	REV **0**
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Extruded	See SDR Table	Plain End	ASTM F714 ASTM D3035	51
FITTING								
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	2 – 12	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50, 51
Long Radius Bends 3-D	2 – 8	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Fabricated	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50
90º Ell, 45º Ell, Lateral Cap, Reducer, Tee,	14 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Fabricated	See SDR Table	Butt Fusion	ASTM D3261 Mfg Std	50
Fusion Branch Saddle	2 – 8	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Socket Weld	ASTM D2467	50
IFlange Adaptor	2 – 36	IPS High Density Polyethylene HDPE	D3350 Class 445574C PE4710	Molded	See SDR Table	Butt Fusion	ASTM D2467	50
FLANGE								
Backing Flange	2 – 36	Stainless Steel	A351 CF8M	Cast	IPP Deltaflex SS-SDR	RF Flange	B16.5 Drilling	
Blind Flange	2 - 36	Stainless Steel	AA182 F316/316L	Forged	Class 150	RF Flange	B16.5	
GASKET	ALL	Restructured Teflon	Garlock 3545		1/8" Thick	Full Face	B16.21	
BOLT	All	Stainless Steel	A193/A320 Gr B8M Class 2	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Stainless Steel	A193/A320 Gr B8M Class 2	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Stainless Steel	A194 Grade 8M	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
WASHER	All	Stainless Steel	ASA 316SS	Hardened		Flat	B18.22.1	

PRESSURE – TEMPERATURE - WALL THICKNESS

SDR	73°F (1.0)	90°F (.90)	100°F (.78)	110°F (.75)	120°F (.63)	130°F (.60)	140°F (.50)
7.3	320 PSIG	288 PSIG	250 PSIG	240 PSIG	202 PSIG	192 PSIG	160 PSIG
9.0	250 PSIG	225 PSIG	195 PSIG	187 PSIG	157 PSIG	150 PSIG	125 PSIG

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	P8X (H_D)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	See Table for Pressure / Temperature Rating	PRESSURE CLASS:		SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

PRESSURE – TEMPERATURE - WALL THICKNESS							
SDR	**73°F (1.0)**	**90°F (.90)**	**100°F (.78)**	**110°F (.75)**	**120°F (.63)**	**130°F (.60)**	**140°F (.50)**
11.0	200 PSIG	180 PSIG	156 PSIG	150 PSIG	126 PSIG	120 PSIG	100 PSIG
13.5	160 PSIG	144 PSIG	124 PSIG	120 PSIG	100 PSIG	96 PSIG	80 PSIG
17.0	125 PSIG	112 PSIG	97 PSIG	93 PSIG	78 PSIG	75 PSIG	62 PSIG
21.0	100 PSIG	90 PSIG	78 PSIG	75 PSIG	63 PSIG	60 PSIG	50 PSIG
26.0	80 PSIG	72 PSIG	62 PSIG	60 PSIG	50 PSIG	48 PSIG	40 PSIG
32.5	63 PSIG	56 PSIG	49 PSIG	47 PSIG	39 PSIG	37 PSIG	31 PSIG

BRANCH CONNECTIONS		
HEADER SIZE	2 – 36	All Branches Use Tees or Reducing Tees. Reducing Branch Saddles May be used.

NOTES	REFERENCE SPECIFICATIONS
14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 23) Specification limited by flange ratings. 24) Specification limited by pipe wall thickness including manufacturing tolerance and corrosion allowance. 47) Flange assembly and bolt torque shall be in accordance with PPI TN-38 and Flange Manufacturers Guidelines. 50) Fabricated fittings shall be produced in the SDR required to withstand the full pressure of the specified, adjoining pipe. 51) All pipe shall be fabricated and installed and butt fusion performed in accordance with the Plastic Pipe Institute. 201) All Heat Fusion of HDPE Joints shall be bonded in accordance with ASTM D2657, PPI Handbook of PE Pipe, Ch 9 and the Applicable ASME Piping Code.	SS-030-002 SS-030-031 PPI Plastic Pipe Institute

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	P9A (HKG)	
APPROVED	TCS	DATE:	07Dec18							
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 73ºF 33 PSIG @ 140º F	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	SS-030-100	REV 0
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ – 24	Polyvinyl Chloride (PVC)	D1784 Class 12454	Extruded	Sch 80	Plain End	ASTM D1785	
FITTING								
90º Ell, 45º Ell, Lateral Cap, , Tee, Wye, Cross, Reducer	½ – 12	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	Socket Weld	ASTM D2467	
90º Ell, 45º Ell, Lateral Cap, , Tee, Wye, Cross, Reducer	14 – 24	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Fabricated	Sch 80	Socket Weld	ASTM D2467 Mfg Std	
Plug	½ - 6	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	Spigot	ASTM D2467	
Reducing Inserts	½ – 12	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	Spigot x SW	ASTM D2467	
Reducing Inserts	14 – 24	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Fabricated	Sch 80	Spigot x SW	ASTM D2467 Mfg Std	
Coupling, Red Coupling	½ – 12	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	SW x SW	ASTM D2467	
Coupling, Red Coupling	14 – 24	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Fabricated	Sch 80	SW x SW	ASTM D2467 Mfg Std	
Female Thread Adaptor Reducing Female Thread Adaptor	½ – 2	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	SW x TE	ASTM D2467	8, 49
UNION	½ – 2	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Sch 80	SW x SW	ASTM D2467	
FLANGE								
One-Piece Socket	½ – 8	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Class 150	SW x Flg	ASTM D2467, B16.5 Drilling	
Two-Piece Van Stone Spigot / Plastic Ring	½ – 12	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Class 150	Spigot x Flg	ASTM D2467, B16.5 Drilling	
Two-Piece Van Stone Socket / Plastic Ring	½ – 16	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Class 150	SW x Flg	ASTM D2467, B16.5 Drilling	
Two-Piece Van Stone Spigot / Steel Ring	14 - 24	PVC Stubend w/ CS Flange Ring	D1784 CLASS 12454-B A36 Galvanized	Fabricated	Class 150	Spigot x Flg	ASTM D2467, B16.5 Drilling	45
Two-Piece Van Stone Socket / Steel Ring	18 - 24	PVC Stubend w/ CS Flange Ring	D1784 CLASS 12454-B A36 Galvanized	Fabricated	Class 150	SW x Flg	ASTM D2467, B16.5 Drilling	45

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**P9A** (HKG)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 73ºF 33 PSIG @ 140º F	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
Blind	½ – 12	Polyvinyl Chloride (PVC)	D1784 CLASS 12454-B	Molded	Class 150	RF Flange	ASTM D2467, B16.5 Drilling	
Blind	14 - 24	Ductile Iron Galv.	A395	Cast	Class 150	RF Flange	B16.42	45
SOLVENT CEMENT	All	PVC Cement	D2564	Liquid	N/A	N/A	ASTM D2855 ASTM F402	
GASKET	ALL	PTFE Bonded to EPDM	Garlock 370		1/8" Thick	Ring Type	B16.21	
BOLT	All	Stainless Steel	A320 Gr B8 Class 1	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Stainless Steel	A320 Gr B8 Class 1	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Stainless Steel	A194 Grade 8	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
WASHER	All	Stainless Steel	ASA 316SS	Wrought		Flat	B18.22.1	

BRANCH CONNECTIONS		
HEADER SIZE	½ – 24	All Branches Use Tees or Reducing Tees. Reducing Inserts May Be Used.

NOTES	REFERENCE SPECIFICATIONS
8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve. 14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve and Insulation codes. 23) Specification limited by flange ratings. 43) All Material for Potable Water use shall be NFS Approved. 44) A vendor-approved latex coating shall be applied to outdoor pipe applications exposed to sunlight. 45) Pipe and fittings shall be hot-dipped galvanized in accordance with ASTM A123. 49) All PVC and CPVC female threaded fittings shall be stainless steel reinforced as manufactured by Spears or equal. 202) All PVC Solvent-Cemented Joints shall be bonded in accordance with ASTM D2855, Fitting Manufacturers Guidelines and the Applicable ASME Piping Code.	SS-030-001 SS-030-002 SS-030-020 SS-030-031

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**P9A** (HKG)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP	150 PSIG @ 73ºF 33 PSIG @ 140º F	PRESSURE CLASS:	150 PSIG	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	S2K (HAD) (JAD)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	150 PSIG @ -20 to 100ºF 150 PSIG @ 300º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ - 2	Duplex SS	A790 S32205/S31803	EFW/SML	Sch 40S	Plain End	B36.19M	
	2½– 30	Duplex SS	A790 S32205/S31803	EFW	Sch 10S	Bevel End	B36.19M	17,35
NIPPLE	½ - 2	Duplex SS	A790 S32205/S31803	EFW/SML	Sch 80S	Plain End/Thrd	ASTM A733	8,35
FITTING								
90º Ell, 45º Ell, Lateral Cap, Plug, Tee, Cross	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Socket Weld	B16.11, SP-95	
Plug	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Threaded	B16.11	
Elbolet, Latrolet, Sockolet	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Socket Weld	SP-97	
Elbolet, Latrolet, Thredolet,	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Threaded	SP-97	8
Coupling, Red Coupling	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Threaded/SW	B16.11, B1.20.1	8
Reducing Insert	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Socket Weld	SP-79	
Swaged Nipples	¾ - 4	Duplex SS	A815 S32205 WP-WX	Wrought	See Pipe	BW x PE	B16.9, SP-95	17
90º Ell, 45º Ell, Tee, Reducer, Cap, Cross	2½ - 30	Duplex SS	A815 S32205 WP-WX	Wrought	Schedule 10S	Butt Weld	B16.9	17
Stub End Type A	½ - 24	Duplex SS	A815 S32205 WP-WX	Wrought	See Pipe	Butt Weld	B16.9, SP-43	17,15
Elbolet, Latrolet, Weldolet	2½ - 24	Duplex SS	A182 F60	Forged	See Pipe	Butt Weld	SP-97	17
UNION	½ - 2	Duplex SS	A182 F60/F51	Forged	Class 3000	Socket Weld	SP-83	12
FLANGE	½ – 2	Duplex SS	A182 F51	Forged	Class 150	Socket Weld	B16.5	5
	2½– 24	Duplex SS	A182 F51	Forged	Class 150	Slip-On	B16.5	4
	10 - 30	Duplex SS	A182 F51 or A240 S32205/S31803	Forged or Plate	Class SD	Slip-On	AWWA C228	4, 23
	½– 24	Carbon Steel	A105N	Forged	Class 150	Lap Joint	B16.5	
	½ – 24	Duplex SS	A182 F51	Forged	Class 150	Blind	B16.5	
	½ – 24	C S w/Duplex Clad	A105N/A240 S32205	Forged	Class 150	Blind	B16.5	
GASKET	ALL	Flexitallic CGI	316 SS/Flexible Graphite Filler	Spiral-Wound	1/8" Thick Class 150	Raised Face	B16.20	36
GASKET	ALL	Restructured PTFE	Garlock 3510		1/8" Thick	Flat Ring or Full Face	B16.21	
SPEC BLIND	½ - 24	Duplex SS	A240 S32205/S31803	Plate	Class 150	Raised Face	B16.48, B46.1	
BLEED RING	½ - 24	Duplex SS	A182 F60/F51	Forged	Class 150	Raised Face	B16.5, B46.1	
BOLT	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		**PROJECT NO:**	**245891**	**MATERIAL IDENTIFICATION:**	**S2K (HAD) (JAD)**		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	150 PSIG @ -20 to 100ºF 150 PSIG @ 300º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
NUT	All	Carbon Steel	A194 Grade 2/2H	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	

BRANCH CONNECTIONS		
HEADER SIZE	½ - 2	All Branches Use Tees or Reducing Tees. Reducing Inserts May Be Used.
HEADER SIZE	2½– 24	Branches ½" – 2" Use Sockolets. Branches 2½"-24" Use Tees or Reducing Tees in accordance with ASME B16.9. All Others Use Weldolets or Reinforced Nozzle Welds.

NOTES	REFERENCE SPECIFICATIONS
4) Slip-on flange fillet welds shall be made on both inside and outside of the flange.	SS-030-001
5) Welding neck and socket weld flange and butt weld valve bore shall match the pipe I.D.	SS-030-002
8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve.	SS-030-010
12) Unions shall have stainless steel to steel ground joints.	SS-030-013
14) Bolt threads shall be coated with molybdenum disulfide before engaging.	SS-030-021
13) All Carbon and Alloy Steel lines 3" and larger and 250°F and hotter and Austenitic Stainless Steel lines 3" and larger and 200°F and hotter shall be reviewed to determine if a stress analysis is required.	SS-030-031 SS-030-033
15) Use MSS length stub ends, unless noted otherwise.	
16) See Service Index for Valve, Gasket and Insulation codes.	
17) Buttweld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted.	
23) Specification limited by flange ratings.	
35) A joint efficiency factor Ej of 1.00 is required for this specification which requires 100% radiographic examination of all longitudinal welds.	
36) Inner rings shall be furnished with all spiral wound gaskets.	
48) Nozzle Weld reinforcement shall be in accordance with Typical Detail TD-030-073.	

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	S4J (CID)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	18May21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	3000 PSIG @ -20 to 100ºF 3000 PSIG @ 200º F	PRESSURE CLASS:	Class 1500	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ - 2	Stainless Steel	A312 TP304/304L	Seamless	Schedule 160	Plain End	B36.19M	33
	2½ - 3	Stainless Steel	A312 TP304/304L	Seamless	Schedule 160	Bevel End	B36.19M	33,17
NIPPLE	½ - 2	Stainless Steel	A312 TP304/304L	Seamless	Schedule XXS	PE x TE	ASTM A733	8, 33
	½ - 2	Stainless Steel	A312 TP304/304L	Seamless	Schedule XXS	Threaded	ASTM A733	8, 33
FITTING								
90º Ell, 45º Ell, Cap, Tee, Cross	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Socket Weld	B16.11	33
Plug	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Socket Weld	B16.11, SP-95	33
Elbolet, Latrolet, Sockolet	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Socket Weld	SP-97	33
Coupling, Red Coupling	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Socket Weld	B16.11	33
Coupling, Red Coupling	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Threaded	B16.11, B1.20.1	33, 8
Elbolet, Latrolet, Thredolet,	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Threaded	SP-97	33, 8
Reducing Inserts	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 6000	Socket Weld	SP-79	33
Swaged Nipples	¾ - 3	Stainless Steel	A403 WP304/304L S	Wrought	Schedule 160	BW x PE	B16.9, SP-95	17, 33
90º Ell, 45º Ell, Tee, Reducer, Cap, Cross	2½ - 3	Stainless Steel	A403 WP304/304L S	Wrought	Schedule 160	Butt Weld	B16.9	17, 33
Elbolet, Latrolet, Weldolet	2½ - 3	Stainless Steel	A182 F304/304L	Forged	Schedule 160	Butt Weld	SP-97	17, 33
FLANGE								
Socket Weld	½ – 2	Stainless Steel	A182 F304/304L	Forged	Class 1500	Raised Face	B16.5	5, 33
Welding Neck	2½ - 3	Stainless Steel	A182 F304/304L	Forged	Class 1500	Raised Face	B16.5	5, 33
Blind	½ – 3	Stainless Steel	A182 F304/304L	Forged	Class 1500	Raised Face	B16.5	33
Butt Weld	½ – 3	Stainless Steel	A182 F304/304L	Forged	SAE Code 61	O-Ring Seal	SAE J518	33
Socket Weld	½ – 2	Stainless Steel	A182 F304/304L	Forged	SAE Code 61	O-Ring Seal	SAE J518	33
GASKET	ALL	Flexitallic CGI	304 SS/Flexible Graphite Filler	Spiral-Wound	Class 1500 $^1/_8$" Thick	Raised Face	B16.20	36
BOLT	All	Stainless Steel	A193Grade B8 Cl 2	Forged	Cl 2A UNC	Socket Head	B1.1, B18.3.1	14
BOLT	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Heavy Hex	B1.1, B18.2.1	14
STUD	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Threaded	B1.1, B18.31.2	14
NUT	All	Carbon Steel	A194 Grade 2/2H	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	
SPEC BLIND	½ - 3	Stainless Steel	A182 F304/304L	Forged	Class 1500	Raised Face	B16.48	33
BLEED RING	½ - 3	Stainless Steel	A182 F304/304L	Forged	Class 1500	Raised Face	B16.5	33

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		**PROJECT NO:**	**245891**	**MATERIAL IDENTIFICATION:**	**S4J (CID)**		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	18May21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	3000 PSIG @ -20 to 100ºF 3000 PSIG @ 200º F	PRESSURE CLASS:	Class 1500	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

BRANCH CONNECTIONS		
HEADER SIZE	½ - 2	All Branches Use Tees or Reducing Tees. Reducing Inserts may be used
HEADER SIZE	2½ – 3	Branches ½" – 1½ Use Sockolets. All others use Tees or Reducing Tees

NOTES	**REFERENCE SPECIFICATIONS**
5) Welding neck and socket weld flange and butt weld valve bore shall match the pipe I.D. 8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve. 14) Bolt threads shall be coated with molybdenum disulfide before engaging. 16) See Service Index for Valve, Gasket and Insulation codes. 17) Buttweld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted. 24) Specification limited by pipe wall thickness including manufacturing tolerance and corrosion allowance. 33) All Series 300 Austenitic Stainless Steel shall be Dual Certified ex: 304/304L unless otherwise noted. The Allowable Stress for the Straight Grade from Table A-1 shall be used in accordance with ASME B31.3 Interpretations 8-18 and 8-3 36) Inner rings shall be furnished with all spiral wound gaskets.	SS-030-001 SS-030-002 SS-030-010 SS-030-013 SS-030-021 SS-030-031

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT		PROJECT NO:	245891	MATERIAL IDENTIFICATION:	S4K (HID)		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	275 PSIG @ -20 to 100ºF 170 PSIG @ 500º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	SS-030-100	REV	0
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
PIPE	½ - 2	Stainless Steel	A312 TP304/304L	EFW/SML	Sch 40S	Plain End	B36.19M	33
	2½– 30	Stainless Steel	A312 TP304/304L	EFW	Sch 10S	Bevel End	B36.19M	33,17
NIPPLE	½ - 2	Stainless Steel	A312 TP304/304L	EFW/SML	Sch 40S	TE x TE PE x TE	ASTM A733	33, 8
FITTING								
90º Ell, 45º Ell, Lateral Cap, Plug, Tee, Cross	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Socket Weld	B16.11, SP-95	33
Plug	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Threaded	B16.11	33
Elbolet, Latrolet, Sockolet	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Socket Weld	SP-97	33
Elbolet, Latrolet, Thredolet,	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Threaded	SP-97	33, 8
Coupling, Red Coupling	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Threaded/SW	B16.11, B1.20.1	33, 8
Reducing Insert	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Socket Weld	SP-79	33
Swaged Nipples	¾ - 4	Stainless Steel	A403 WP304/304L W	Wrought	See Pipe	BW x PE	B16.9, SP-95	33,17
90º Ell, 45º Ell, Tee, Reducer, Cap, Cross	2½ - 30	Stainless Steel	A403 WP304/304L W	Wrought	Schedule 10S	Butt Weld	B16.9	33,17
Stub End Short Pattern	½ - 24	Stainless Steel	A403 WP304/304L W	Wrought	See Pipe	Butt Weld	B16.9	33,17,15
Elbolet, Latrolet, Weldolet	2½ - 24	Stainless Steel	A182 F304/304L	Forged	See Pipe	Butt Weld	SP-97	33,17
UNION	½ - 2	Stainless Steel	A182 F304/304L	Forged	Class 3000	Socket Weld	SP-83	12, 33
FLANGE								
Socket Weld	½ – 2	Stainless Steel	A182 F304/304L	Forged	Class 150	Raised Face	B16.5	1, 5, 33
Slip-On	2½– 24	Stainless Steel	A182 F304/304L	Forged	Class 150	Raised Face	B16.5	1, 4, 33
Welding Neck	26 – 30	Stainless Steel	A182 F304/304L	Forged	Class 150	Raised Face	B16.47 Series A	1, 5, 33
Lap Joint	½– 24	Galv Carbon Steel	A105	Forged	Class 150	Raised Face	B16.5	45
Blind	½ – 24	Stainless Steel	A182 F304/304L	Forged	Class 150	Raised Face	B16.5	33
Blind	26 – 30	Stainless Steel	A182 F304/304L	Forged	Class 150	Raised Face	B16.47 Series A	33
GASKET	ALL	Restructured PTFE	Garlock 3510		1/8" Thick	Flat Ring	B16.21	
SPEC BLIND	½ - 30	Stainless Steel	A240 Type 304/304L	Plate	Class 150	Raised Face	B16.48, B46.1	33
BLEED RING	½ - 24	Stainless Steel	A240 Type 304/304L	Plate	Class 150	Raised Face	B16.5, B46.1	33
BOLT	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Heavy Hex	B18.2.1	14
STUD	All	Alloy Steel	A193 Grade B7	Forged	Cl 2A UNC/8UN	Threaded	B18.31.2	14
NUT	All	Carbon Steel	A194 Grade 2/2H	Forged	Cl 2B UNC/8UN	Heavy Hex	B18.2.2	

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		**PROJECT NO:**	**245891**	**MATERIAL IDENTIFICATION:**	**S4K (HID)**		
APPROVED	TCS	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	275 PSIG @ -20 to 100ºF 170 PSIG @ 500º F	PRESSURE CLASS:	Class 150	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

BRANCH CONNECTIONS		
HEADER SIZE	½ - 2	All Branches Use Tees or Reducing Tees. Reducing Inserts May Be Used.
HEADER SIZE	2½– 30	Branches ½" – 2" Use Sockolets. Branches 2½"-30" Use Tees or Reducing Tees in accordance with ASME B16.9. All Others Use Weldolets or Reinforced Nozzle Welds.

NOTES	**REFERENCE SPECIFICATIONS**
1) Use flat face flange with full face gasket when mating with cast iron Class 125 flange.	SS-030-001
4) Slip-on flange fillet welds shall be made on both inside and outside of the flange.	SS-030-002
5) Welding neck and socket weld flange and butt weld valve bore shall match the pipe I.D.	SS-030-010
8) Limit threaded connections to equipment connections and to instrument connections down stream of block valve.	SS-030-013
12) Unions shall have stainless steel to steel ground joints.	SS-030-021
13) All Carbon and Alloy Steel lines 3" and larger and 250°F and hotter and Austenitic Stainless Steel lines 3" and larger and 200°F and hotter shall be reviewed to determine if a stress analysis is required.	SS-030-031
14) Bolt threads shall be coated with molybdenum disulfide before engaging.	
15) Use MSS length stub ends, unless noted otherwise.	
16) See Service Index for Valve, and Insulation codes.	
17) Buttweld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted.	
23) Specification limited by flange ratings.	
33) All Series 300 Austenitic Stainless Steel shall be Dual Certified ex: 304/304L unless otherwise noted. The Allowable Stress for the Straight Grade from Table A-1 shall be used in accordance with ASME B31.3 Interpretations 8-18 and 8-3	
45) Pipe and fittings shall be hot-dipped galvanized in accordance with ASTM A123.	
48) Nozzle Weld reinforcement shall be in accordance with Typical Detail TD-030-073.	

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**S6T (CID)**		
APPROVED	MLT	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	2000 PSIG @ -20 to 100ºF 2000 PSIG @ 400º F	PRESSURE CLASS:	2000 psig	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM/API	MFG. METHOD	PRESSURE CLASS /WALL THICKNESS	END PREP	DIMENSIONAL TOLERANCE ANSI/ASME/MSS	NOTES
TUBING	¼ - 3/8	Stainless Steel	A269 TP316	Seamless	0.035" Wall	Plain End	ASTM A1016	55
	½ - 5/8	Stainless Steel	A269 TP316	Seamless	0.049" Wall	Plain End	ASTM A1016	55
	¾ – 7/8	Stainless Steel	A269 TP316	EFW	0.065" Wall	Plain End	ASTM A1016	55
	1	Stainless Steel	A269 TP316	EFW	0.095" Wall	Plain End	ASTM A1016	55
	1¼-1½	Stainless Steel	A269 TP316	EFW	0.125" Wall	Plain End	ASTM A1016	55
FITTING								
90º Ell, 45º Ell, Tee, Cross, Union, Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x Comp	Mfg Std	56
90º Ell, 45º Ell, Tee, Cross, Union, Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x SW	Mfg Std	56
90º Ell, 45º Ell, Tee, Cross, Union, Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x NPT	Mfg Std	56
90º Ell, 45º Ell, Tee, Cross, Union, Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x NPTF	Mfg Std	56
Bulkhead Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x Comp	Mfg Std	56
Bulkhead Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x SW	Mfg Std	56
Bulkhead Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x NPT	Mfg Std	56
Bulkhead Connector	¼ - 1½	Stainless Steel	A182 F316/316L	Forged	2000 psig	Comp x NPTF	Mfg Std	56

BRANCH CONNECTIONS		
HEADER SIZE	¼ - 1½	All Branches Use Tees

NOTES	REFERENCE SPECIFICATIONS
16) See Service Index for Valve, Gasket and Insulation codes. 17) Buttweld ends shall be prepared in accordance with ASME B16.25 unless otherwise noted. 33) All Series 300 Austenitic Stainless Steel shall be Dual Certified ex: 316/316L unless otherwise noted. The Allowable Stress for the Straight Grade from Table A-1 shall be used in accordance with ASME B31.3 Interpretations 8-18 and 8-3 55) Tubing shall be fully annealed, straight, free of scratches, suitable for bending with a maximum hardness of Rb80. 56) Use bends for changes in direction where possible. Bending shall be performed with a hydraulic bending tool. 57) Assemble Fittings in strict accordance with manufacturer's guidelines. 58) Fittings shall be compression type as manufactured by Swagelok or approved equal.	SS-030-001 SS-030-002 SS-030-031

PIPING MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	07Dec18	**BIG RIVERS ELECRIC CORP. D. B. WILSON STATION FGD RETROFIT**		PROJECT NO:	**245891**	**MATERIAL IDENTIFICATION:**	**S6T** (CID)		
APPROVED	MLT	DATE:	07Dec18								
REVISED:	CKF	DATE:	19Feb21	DESIGN CONDITIONS MAWP @ MAX LOW TEMP MAWP @ MAX HIGH TEMP CORR ALLOW = 0	2000 PSIG @ -20 to 100ºF 2000 PSIG @ 400º F	PRESSURE CLASS:	2000 psig	SPECIFICATION NUMBER:	**SS-030-100**	REV	**0**
ISSUED:		DATE:									

ABBREVIATIONS									
DI	Ductile Iron	**BE**	Beveled End	**PE**	Plain End	**SCH**	Schedule	**NPTF**	NPT Female
CL	Class	**FS**	Forged Steel	**SW**	Socket Weld	**XS**	Extra Strong	**GR**	Grade
CI	Cast Iron	**FF**	Flat Face	**BW**	Butt Weld	**XXS**	Double Extra Strong	**TP**	Type
MI	Malleable Iron	**RF**	Raised Face	**TE**	Threaded End	**NPT**	National Pipe Thread		

Piping Specification

Title:	**Valve Identification**		
Project Doc. No.:	**SS-030-111**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	
B	25Mar21	Bids		CKF	TCS	
0	20Jul21	Construction		CKF	TCS	

The Identification Codes shown in (RED in Brackets) on the Service Index, Piping Material Specifications and Valve Specifications of this document are in accordance with Wood P&ID Legend Sheet 143993-03-100. These Identification Codes shall be used for the Pipeline List, Valve List and P&ID.

Wood equivalent Identification Codes shown in this document are used for Balance of Plant Piping Isometrics. (Material provided by Contractor)

1. VALVE IDENTIFICATION

1.1. PURPOSE

A four-digit code identifies manual valves on P&ID's, piping drawings and in specifications. The code identifies the valve as to type, body-trim material combination, rating class, end preparation and other, special features as shown. The code, which identifies knife gate valves, follows the basic code but due to their special role a slightly modified coding system has been used to indicate special requirements (see par. 6.). Instrument valves are not part of this specification.

1	**4**	**A**	**F**
1	**4**	**A**	**F**
Valve type	Body/Trim Material	Pressure Class	End Preparation

2. VALVE NUMBERING FORMAT

2.1. STANDARD VALVES

2.1.1. *Valve Type*. The first digit indicates the general valve type, as follows:

Digit	Valve Type	Digit	Valve Type
1	Gate Valve	6	Ball Valve
2	Globe Valve	7	Butterfly Valve
3	Check Valve	8	Diaphragm Valve
4*	Knife Gate Valve	9	Special Valve
5	Plug Valve	0	Open

* Knife gate valves are typified in paragraph 2.2, below.

2.1.2. *Body/Trim Material Combinations.* The second digit of the code indicates very generally the body-trim combination. Due to the many body-trim material combinations available in valves, the recognition code is set up for major groups only. The valve specifications sheets will cover specific items such as stem, seat, and disk materials within each group.

Digit	Body	Trim
0	Bronze	Bronze and Brass Stainless Steel
1	Cast Iron Ductile Iron	Cast or Malleable Iron Steel
2	Cast Iron Ductile Iron	Bronze and Brass Nickel Bronze
3	Nickel Cast Iron Ni-resist	Stainless Steel

Digit	Body	Trim
4	Cast Carbon Steel Forged Steel	Stainless Steel
5	Cast Alloy Steel Forged Alloy Steel	Stainless Steel
6	Cast Steel or Forged Steel Cast or Ductile Iron	Nickel Alloy Stainless Steel
7	Stainless Steel	Stainless Steel
8	Plastic Lined Plastic	Plastic
9	Special	Special

2.1.3. *Valve Rating (Class)*. Valve service ratings are based on the following industry standards:

- ASME B16.34, Valves - Flanged, Threaded, and Welding End
- ASME B16.38, Large Metallic Valves for Gas Distribution
- API 6D, Specification for Pipeline Valves
- API 594, Check Valves: Flanged, Lug, Wafer and Butt-welding
- API 599, Metal Plug Valves – Flanged, Threaded and Welding Ends
- API 600, Steel Gate Valves – Flanged and Butt-welding Ends, Bolted Bonnets
- API 602, Steel Gate, Globe and Check Valves for Sizes NPS 4 (DN 100) and Smaller for the Petroleum and Natural Gas Industries
- API 603, Corrosion-Resistant, Bolted Bonnet Gate Valves – Flanged and Butt-welding Ends
- API 608, Metal Ball Valves – Flanged, Threaded, and Welding Ends
- API 609, Butterfly Valves: Double-flanged, Lug- and Wafer-type
- API 623, Steel Globe Valves - Flanged and Butt-welding Ends, Bolted Bonnet
- MSS SP-42, Corrosion-Resistant Gate, Globe, Angle and Check Valves with Flanged and Butt Weld Ends (Class 150, 300 & 600)
- MSS SP-67, Butterfly Valves
- MSS SP-68, High Pressure Butterfly Valves with Offset Design
- MSS SP-70, Grey Iron Gate Valves, Flanged and Threaded Ends
- MSS SP-71, Grey Iron Swing Check Valves, Flanged and Threaded Ends
- MSS SP-72, Ball Valves with Flanged or Butt-Welding Ends for General Service
- MSS SP-78, Grey Iron Plug Valves, Flanged and Threaded Ends
- MSS SP-80, Bronze Gate, Globe, Angle and Check Valves

- MSS SP-81, Stainless-Steel or Stainless-Steel-Lined Bonnetless Knife Gate Valves with Flanged Ends (see par. 2.2) .
- MSS SP-85, Grey Iron Globe and Angle Valves, Flanged and Threaded Ends
- MSS SP-88, Diaphragm Valves
- MSS SP-108, Resilient-Seated Cast Iron Eccentric Plug Valves
- MSS SP-110, Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
- MSS SP-122, Plastic Industrial Ball Valves
- MSS SP-125, Grey Iron and Ductile Iron In-Line, Spring-Loaded, Center-Guided Check Valves
- MSS SP-126, Steel In-Line Spring-Assisted Center-Guided Check Valves
- MSS SP-128, Ductile Iron Gate Valves
- MSS SP-131, Metallic Manually Operated Gas Distribution Valves
- MSS SP-133, Excess Flow Valves for Low Pressure Fuel Gas Applications
- MSS SP-134, Valves for Cryogenic Service, Including Requirements for Body/Bonnet Extensions
- MSS SP-135, High Pressure Knife Gate Valves
- MSS SP-136, Ductile Iron Swing Check Valves
- MSS SP-144, Pressure Seal Bonnet Valves

2.1.4. *Service Class Code*. In the following table service class codes are based on the standards listed in 3.1.3., above. Basic ratings are based on ASME B16.34 classes: as follows:

- Letters A—F represent the basic classes (pressure/temperature ratings) 150, 300. 600, 900, 1500, and 2500 for carbon steel valves. Class 400 is not included because it is rarely used. If used it will be treated as a special class. Class 600 is considered equivalent to API 602 and 606 Class 800 rating. The classes for materials other than cast or forged carbon steel are the closest available class ratings published for these materials as ASME, API, or MSS industry standards. .
- Letters G—M repeat the six basic classes listed under letters A—F, above. Repetition allows the coding and separation of special features as for example 67AF standing for a *reduced port* ball valve and 67GF standing for a *full port* ball valve, both Class 150, stainless steel, flanged.
- Letters N—Q repeat the 3 lower class ratings 150, 300, and 600 and allow for additional permutations.
- Letters R—T repeat the 3 lower class ratings 150, 300, and 600 and allow for still more additional permutations of valve design and selection.
- Letters U—Z are provided for special classes and special designs. Included in these are valves for special services, such as very high pressure hydraulic oil valves and other

valve designs and types not falling within standard industry categories, such as safety valves, bellows-seal valves, special trim combinations, and other special designs.

2.1.5. *Pressure/Temperature Ratings*. ANSI class ratings for **steam service** are given as ratings at elevated temperatures, i.e., Class 150 = 150 PSIG at 560°F, Class 300 = 300 PSIG at 825°F, and for all other classes the steam rating is reached at 825°F. All other ratings are **Water/Oil/Gas service** (WOG or CWP) with the service rating given as 150°F. **Special service** ratings are as specified in the individual valve specification sheet.

2.1.6. *Table of Service Class Codes*.

	Service Rating or Class						
	Steam		**Water/Oil/Gas (WOG) and Process**				
Digit	**CS**	**FS**	**CI**	**DI**	**BRONZE**	**SS**	**AL**
A	150		125/150	150/200	150/200	125/150	100
B	300		250/300	300	300	300	
C	600	600				600	
D	900	900					
E	1500	1500					
F	2500	2500					
G	150		125/150	150/200	150/200	125/150	100
H	300		250/300	300	300	300	
J	600	600				600	
K	900	900					
L	1500	1500					
M	2500	2500					
N	150		125/150	150/200	150/200	125/150	100
P	300		250/300	300	300	300	
Q	600	600				600	
R	150		125/150	150/200	150/200	125/150	100
S	300		250/300	300	300	300	
T	600	600				600	
U	LETTERS U THROUGH Z ARE RESERVED FOR SPECIAL APPLICATIONS						
V							
W - Z							

2.1.7. *End Preparation*. Valve end preparation is indicated by an alphanumeric code as follows:

Digit	End Preparation
A	Wafer (including wafer and lug type)
B	Brazed or Soldered
C	Flanged (Canadian std.)
D	OPEN
E	Belled
F	Flanged (ASME std.)
G	OPEN
H	OPEN
J	OPEN
K	OPEN
L	Flared (Tubing)
M	Mechanical Jointed
N	OPEN
P	Pressure-Seal Buttwelded
Q	OPEN
R	Compression (Tubing)
S	Socket Welded
T	Threaded
U	OPEN
V	VictaulicType.
W	Butt Welded
X	OPEN
Y	Tyton Type
Z	OPEN

2.2. KNIFE GATE VALVES

2.2.1. *Type Code*. Knife gate valves have been combined into the “4000” series valve types. Thus, the first digit for all knife gate valve numbers is a “4.” A typical knife gate valve number looks as follows:

4	**4**	**A**	**A**
4	**4**	**A**	**A**

Knife gate Valve	Body/Trim Material	Valve Type	End Preparation

2.2.2. *Material Code*. The body/trim material code is the second digit in the valve number and signifies the material exposed to the process stream. It ordinarily includes the seats and knife in lined valves or may indicate overall metallurgy in cast valves. Refer to the valve specification sheet for secondary materials such as used for flanges, bolting, and other appurtenances:

Digit	Body/Trim Alloy Type
0	Special alloy per project specifications
1	Special alloy per project specifications
2	Hastelloy C-276 (UNS N10276)
3	904L (UNS NO8904)
4	304L Stainless Steel (UNS S30403)
5	254 SMO (UNS S31254)
6	316L Stainless Steel (UNS S31603)
7	317L Stainless Steel (UNS S31703)
8	Fiberglass
9	Titanium (UNS R50400)
A-Z	open for future use

2.2.3. *Valve Type Code*.

Serial Type	Type Designation
A	Knife Gate, Metal Seat
B	Knife Gate, Resilient Seat
C	Knife Gate, Special Drilling
D	Knife Gate, V-port
E	Slide Gate
F	Slide Gate, Diamond Port
G	Knife Gate, Polyurethane Seat
H	Knife Gate, Fiberglass Lined
J	Wedge Gate
K-Z	open for future use

2.2.4. *End Preparation*. Codes for valve end preparation shall conform to paragraph 2.1.7., above. The most common codes used will be “A” and “F,” as follows:

Digit	End Preparation
A	Wafer (TAPPI std.) (including wafer and lug type)
B-E	OPEN
F	Flanged (ANSI std.)
G-Z	OPEN

END OF DOCUMENT

Title:	**Valve Specification**	
Project Doc. No.:	**SS-030-112**	Revision No.:

Valve Specifications

Vendor names, figure numbers and dimensions listed on the specification sheets are provided to assist in the layout and purchase of valves. All figure numbers and dimensions are believed to be correct. Verify all information with vendors before procurement and construction. The vendor names provided represent a thorough sampling of available manufacturers with whom we have experience. This list is by no means complete and is not intended to exclude other manufacturers. Substitutions shall be submitted for approval to the owner or owner's representative.

VALVE SPECIFICATION

GATE / CLASS 150 / CARBON STEEL / FLANGED

14AF (G41N)

BODY

Type:	Gate
Material:	Cast Carbon Steel A216 Gr WCB
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted, OS&Y
Coating:	Mfg Std
Options:	Backseat, Integral By-Pass Upon Request

TRIM

Disc Type:	Flexible wedge
Disc Material	SS 13% Cr Hardened Face
Bore/Port:	Standard/Full
Seat:	Renewable, Welded, Hardened
Stem:	SS 13% Cr
Seal/Packing:	Graphite

OPERATOR

Type:	Rising Stem
Handwheel:	12” and Smaller
Gear Operator:	14” and Larger
Lever:	
Options:	Chain Wheel Where Shown on Dwgs

STANDARDS

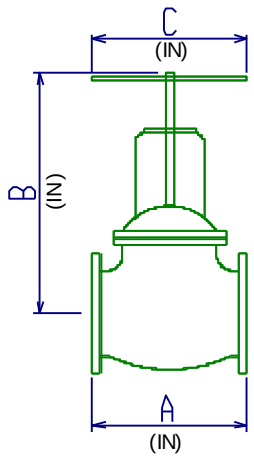
Design	API 600, ASME B16.34
End Prep	ASME B16.5, ASME B16.47 Series A
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturers
2.
3.

DIMENSIONS

SIZE	A	B*	C*
2	7.00	16	8
2½	7.50	17	8
3	8.00	19	9
4	9.00	23	10
6	10.50	31	12
8	11.50	39	16
10	13.00	47	16
12	14.00	55	18
14	15.00	61	20
16	16.00	67	20
18	17.00	77	24
20	18.00	89	30
24	20.00	104	36
30	24.00	130	38
36	28.00	144	38
42	31.00*	169	38
48	36.00*	191	38



MANUFACTURER	MODEL
Newco	11FCB2
Pacific	2155
Powell	1503
Stockham	15-OF-U
Velan	F-0064C-02TY

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV”	0

VALVE SPECIFICATION

GATE / CLASS 600 / CARBON STEEL / SOCKET WELD

14CS (G43S)

BODY

Type:	Gate
Material:	Forged Carbon Steel A105
End Prep:	Socket Weld
Pressure Class:	ASME Class 600, API 602 Class 800
Bonnet:	Bolted, OS&Y
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Solid
Disc Material	SS 13% Cr
Bore/Port:	Conventional
Seat:	SS 13% Cr, Stellite Face
Stem:	SS 13% Cr
Seal/Packing:	Graphite

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

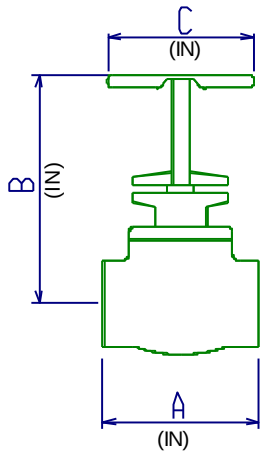
Design	ASME B16.34, API 602
End Prep	ASME B16.11
Pressure Rating	ASME B16.34. API 602
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
¼	3.13	5	3
⅜	3.13	5	3
½	3.13	5	3
¾	3.25	6	4
1	3.50	7	4
1¼	5.00	8	5
1½	5.00	8	5
2	5.25	9	6



MANUFACTURER	MODEL
Bonney Forge	H 10
Newco	18FS-FS2
Velan	W-2054B-02TY
Vogt	SW-12111

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VALVE SPECIFICATION

GATE / CLASS 150 / STAINLESS STEEL / SOCKET WELD

17AS (G71S)

BODY

Type:	Gate
Material:	Stainless Steel A351 Gr CF3M
End Prep:	Socket Weld
Pressure Class:	ASME Class 150
Bonnet:	Bolted, OS&Y
Coating:	N/A
Options:	

TRIM

Disc Type:	Solid
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Standard
Seat:	Integral
Stem:	Stainless Steel Type 316
Seal/Packing:	PTFE

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

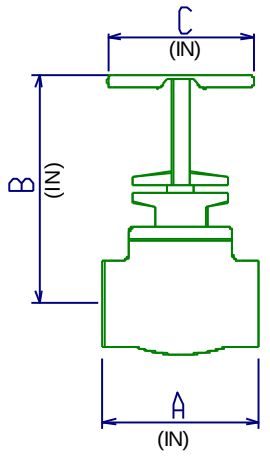
Design	ASME B 16.34, API 603
End Prep	ASME B16.11
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
½	2.60	8	4
¾	2.90	8	4
1	3.40	9	4
1½	4.40	11	6
2	4.60	13	6



MANUFACTURER	MODEL
Aloyco	114
Kitz	AW150UMM
Ladish	8274
Powell	2490SWE

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VALVE SPECIFICATION

GLOBE / CLASS 150 / CARBON STEEL / FLANGED

24AF (L41N)

BODY

Type:	Globe
Material:	Cast Carbon Steel A216 Gr WCB
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted, OS&Y
Coating:	Mfg Std
Options:	Back Seat, Integral By-Pass Upon Request

TRIM

Disc Type:	Plug Type
Disc Material	Stainless Steel / 13% Cr Facing
Bore/Port:	Full
Seat:	Renewable, SS, Stellite Facing
Stem:	Stainless Steel
Seal/Packing:	Graphite

OPERATOR

Type:	Rising Stem
Handwheel:	12” and Smaller
Gear Operator:	14” and Larger
Lever:	N/A
Options:	

STANDARDS

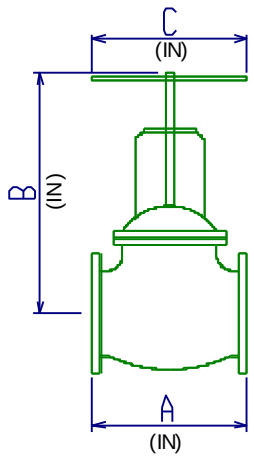
Design	API 600, ASME B16.34
End Prep	ASME B16.5
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer.
2.
3.

DIMENSIONS

SIZE	A	B*	C*
1½	6.50	13	8
2	8.00	18	8
2½	8.50	18	10
3	9.50	19	10
4	11.50	22	12
6	16.00	28	14
8	19.50	33	18
10	24.50	38	22
12	27.50	46	24
14	31.00	45	27
16	36.00	55	30
18	37.50	62	30



MANUFACTURER	MODEL
Newco	21F-CB2
Pacific	160-2
Powell	1531-FE
Velan	F-0074C-02TY

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VALVE SPECIFICATION

GLOBE / CLASS 600 / CARBON STEEL / SOCKET WELD

24CS (L43S)

BODY

Type:	Globe
Material:	Forged Carbon Steel A105N
End Prep:	Socket Weld
Pressure Class:	ASME Class 600, API Class 800
Bonnet:	Bolted, OS&Y Vertical
Coating:	Mfg Std
Options:	Internal Backseat

TRIM

Disc Type:	Plug Type, Loose Coupled
Disc Material	Stainless Steel 13% Cr, Hard Face
Bore/Port:	Conventional
Seat:	Stainless Steel 13% Cr, Stellite Face
Stem:	Stainless Steel 13% Cr
Seal/Packing:	Graphite

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

Design	ASME 16.34, API 602
End Prep	ASME B16.11
Pressure Rating	ASME B16.34, API 602
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Special:	

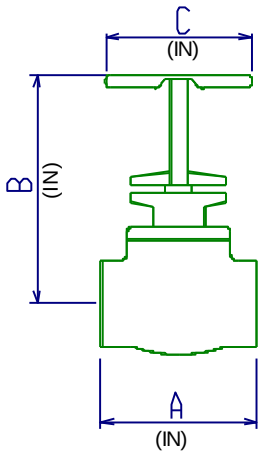
NOTES

1. * Verify dimension with manufacturer
2.
3.

MANUFACTURER	MODEL
Bonney Forge	HL30
Newco	28S-FS2
Velan*	W-2074B-02TY
Vogt	SW-12141

DIMENSIONS

SIZE	A*	B*	C*
¼	2.88	5	3
⅜	2.88	5	3
½	2.88	8	4
¾	3.25	8	4
1	3.50	8	5
1¼	5.00	9	6
1½	5.00	9	6
2	8.00	12	8



CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

GLOBE / CLASS 150 / STAINLESS STEEL / FLANGED

27AF (L71N)

BODY

Type:	Globe
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted, OS&Y
Coating:	N/A
Options:	Backseat

TRIM

Disc Type:	Plug Type
Disc Material	Stainless Steel A276 Tp 316
Bore/Port:	Standard
Seat:	Integral, Hardened Face
Stem:	Stainless Steel A276 Tp 316
Seal/Packing:	Graphite

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

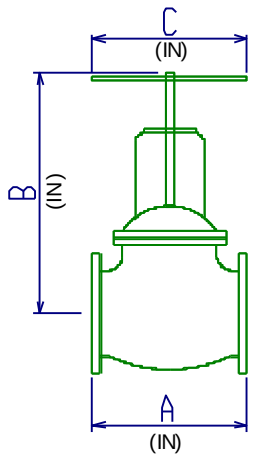
Design	ASME B16.34, API 603
End Prep	ASME B16.5, ASME B16.47 Series A
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
½	4.25	9	4
¾	4.63	9	4
1	5.00	10	4
1½	6.50	13	8
2	8.00	18	8
2½	8.50	18	10
3	9.50	19	10
4	11.50	22	12
6	16.00	28	15
8	19.50	33	18
10	24.50	38	22
12	27.50	42	22
14	31.00	60	24



MANUFACTURER	MODEL
Aloyco	317
OIC	S 152
Powell	2475 / 2629
Velan	F-0074C-13GY

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VALVE SPECIFICATION

GLOBE / CLASS 150 / STAINLESS STEEL / SOCKET WELD

27AS (L71S)

BODY

Type:	Globe
Material:	Stainless Steel A351 Gr CF3M
End Prep:	Socket Weld
Pressure Class:	ASME Class 150
Bonnet:	Bolted, OS&Y
Coating:	N/A
Options:	

TRIM

Disc Type:	Plug Type
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Conventional
Seat:	Integral, Stainless Steel A351 Gr CF8M
Stem:	Stainless Steel A276 T316
Seal/Packing:	PTFE

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

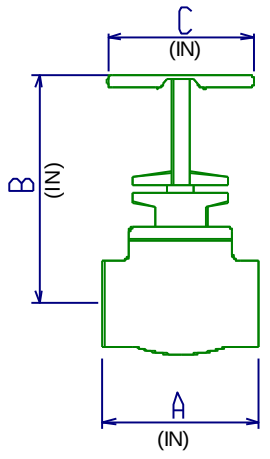
Design	ASME B16.34, MSS SP-42
End Prep	ASME B16.11
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
½	3.74	8	4
¾	4.53	8	4
1	4.92	8	4
1½	5.52	10	6
2	6.50	11	7



MANUFACTURER	MODEL
Aloyco	314
Kitz	AW150-UPM

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VALVE SPECIFICATION

wood.

GLOBE / CLASS 1500 / STAINLESS STEEL / COMPRESSION

27ER (L75X)

BODY

Type:	Globe
Material:	Forged Stainless Steel A182 F316
End Prep:	Compression Type
Pressure Class:	ASME Class 2080
Bonnet:	Threaded
Coating:	N/A
Options:	

TRIM

Disc Type:	Plug Type
Disc Material	Stainless Steel 13%Cr
Bore/Port:	Mfg Std
Seat:	Integral, Stainless Steel 13% Cr or Stellite
Stem:	Stainless Steel 13%Cr
Seal/Packing:	Teflon

OPERATOR

Type:	Rising Stem
Handwheel:	Yes
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

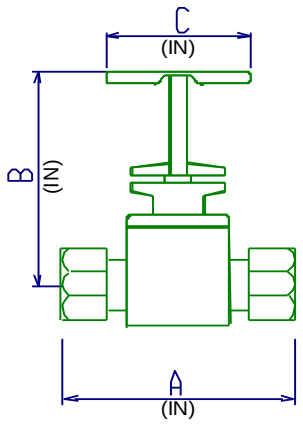
Design	ASME B16.34
End Prep	Mfg Std
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
¼	2.27	4	1
⅜	2.58	4	2
½	2.80	4	2
¾	3.80	4	3



MANUFACTURER	MODEL
Parker	V6 Series
Whitey/Swagelok	SS Series

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VALVE SPECIFICATION

CHECK / CLASS 125 / LINED CAST IRON / FLANGED

32GF (C21N)

BODY

Type:	Flexible Swing Check
Material:	Ductile Iron A536 Grade 65-45-12 / Rubber Lined
End Prep:	Flanged
Pressure Class:	ASME Class 125
Bonnet:	Bolted
Coating:	Fusion Bonded Epoxy Outside / Rubber Lined
Options:	Disc Positioner Included

TRIM

Disc Type:	Flexible Swing Type
Disc Material	Buna-N Rubber Encapsulated, Steel Reinforced
Bore/Port:	Full 100% Flow Area
Seat:	O-Ring Seating Edge on Disc
Stem:	N/A
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

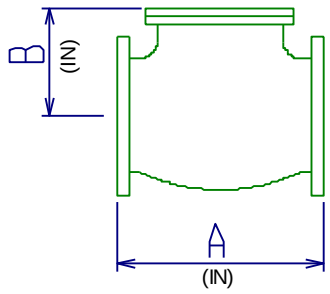
Design	AWWA C508
End Prep	ASME B16.1
Pressure Rating	250 CWP
Dimensional	ASME B16.10, AWWA C508
Marking:	MSS SP-25
Special:	

NOTES

1. *Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	
2	8.00	6	
2½	8.50	6	
3	9.50	9	
4	11.50	11	
6	14.00	12	
8	19.50	14	
10	24.50	16	
12	27.50	18	
14	31.00	19	
16	36.00	20	
18	40.00	21	
20	40.00	22	
24	48.00	35	



MANUFACTURER	MODEL
APCO	100R
Valmatic	Series 500

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VALVE SPECIFICATION

CHECK / CLASS 150 / CARBON STEEL / FLANGED

34AF (C41N)

BODY

Type:	Check
Material:	Cast Carbon Steel A216 Gr WCB
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Swing Type
Disc Material	Stainless Steel 13% Cr
Bore/Port:	Full
Seat:	Renewable, Seal Welded, SS, Stellite Faced
Pin:	Stainless Steel A182 F6a
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

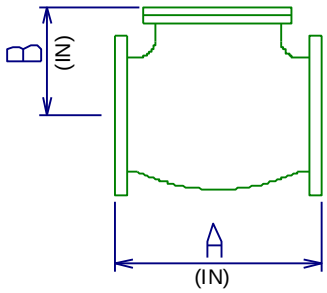
Design	API 600, ASME B16.34
End Prep	ASME B16.5, ASME B16.47 Series A
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	
1	5.00	4	
1½	6.50	6	
2	8.00	7	
2½	8.50	8	
3	9.50	8	
4	11.50	9	
6	14.00	13	
8	19.50	15	
10	24.50	18	
12	27.50	18	
14	31.00	20	
16	34.00	22	
18	38.50	25	
20	38.50	28	
24	51.00	34	
30	60.00	40	



MANUFACTURER	MODEL
Newco	31F-CB2
Pacific	180/184
Powell	1561
Velan	F-0114C-02TY

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VALVE SPECIFICATION

CHECK / CLASS 600 / CARBON STEEL / SOCKET WELD

34CS (C43S)

BODY

Type:	Check
Material:	Forged Carbon Steel A105/A216 Gr WCB
End Prep:	Socket Weld
Pressure Class:	ASME Class 600, API Class 800
Bonnet:	Bolted, Vertical
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Lift Piston Type
Disc Material	Stainless Steel 13% Cr, Stellite Face
Bore/Port:	Conventional
Seat:	Integral Stainless Steel 13% Cr, Stellite Face
Stem:	N/A
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

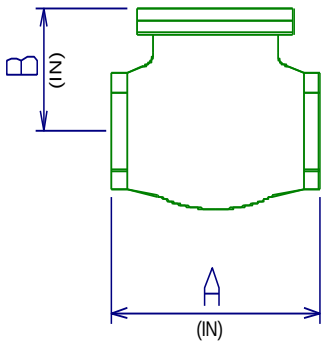
Design	ASME 16.34
End Prep	ASME B16.11
Pressure Rating	ASME B16.34, API 602
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	
¼	2.88	2	
⅜	2.88	2	
½	2.88	2	
¾	3.25	3	
1	3.50	3	
1¼	5.00	4	
1½	5.00	4	
2	8.00	5	



MANUFACTURER	MODEL
Bonney Forge	HL 41
Velan	W-2034B-02TS
Vogt	SW-701

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VALVE SPECIFICATION

CHECK / CLASS 150 / STAINLESS STEEL / FLANGED

37AF (C71N)

BODY

Type:	Check
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted
Coating:	N/A
Options:	

TRIM

Disc Type:	Swing Type
Disc Material	Stainless Steel Type 316
Bore/Port:	Standard
Seat:	Integral, Hardened Face
Stem/Pin:	Stainless Steel A276/A182 F316
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

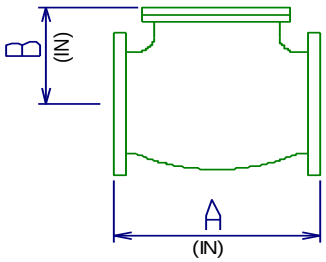
Design	ASME B16.34, API 603
End Prep	ASME B16.5
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	API 598, ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	
½	4.25	3	
¾	4.63	4	
1	5.00	4	
1½	6.50	5	
2	8.00	7	
2½	8.50	8	
3	9.50	8	
4	11.50	9	
6	14.00	11	
8	19.50	13	
10	24.50	16	
12	27.50	17	
14	31.00	20	
16	34.00	22	
18	38.50	25	
20	38.50	27	
24	51.00	31	



MANUFACTURER	MODEL
Aloyco	377
Ladish	5272
Powell	2342/2633
Velan	F-0114C-13GX

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VALVE SPECIFICATION

CHECK / CLASS 150 / STAINLESS STEEL / SOCKET WELD

37AS (C71S)

BODY

Type:	Check
Material:	Stainless Steel A351 Gr CF3M
End Prep:	Socket Weld
Pressure Class:	ASME Class 150
Bonnet:	Bolted
Coating:	N/A
Options:	

TRIM

Disc Type:	Swing Type
Disc Material	Stainless Steel Type 316
Bore/Port:	Conventional
Seat:	Integral, Stainless Steel Type 316
Stem/Pin:	Stainless Steel Type 316
Seal/Packing:	PTFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

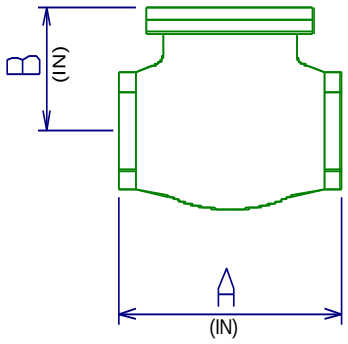
Design	ASME B16.34, MSS SP-42
End Prep	ASME B16.11
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25, ASME B16.34
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	
½	3.35	3	
¾	3.74	4	
1	4.53	4	
1½	4.92	5	
2	5.91	5	



MANUFACTURER	MODEL
Aloyco	374
Kitz	AW150UOM

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VALVE SPECIFICATION

CHECK / CLASS 1500 / STAINLESS STEEL / COMPRESSION FIT

37ER (C75X)

BODY

Type:	Check
Material:	Stainless Steel ASTM A276 Type 316
End Prep:	Compression Type
Pressure Class:	ASME Class 1500 (3000 psig @ 100ºF)
Bonnet:	N/A
Coating:	N/A
Options:	

TRIM

Disc Type:	Poppet Type
Disc Material	Stainless Steel 316
Bore/Port:	Mfg Std
Seat:	Plastic, Viton
Spring:	Stainless Steel 316
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

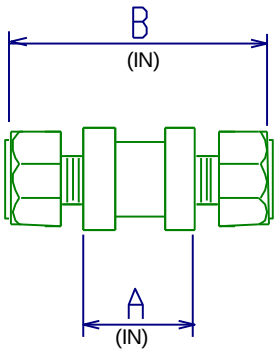
Design	ASME B16.34
End Prep	Mfg Std
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimension with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	
¼	1.03	2.42	
⅜	1.75	3.27	
½	2.34	4.08	
¾	2.60	4.34	



MANUFACTURER	MODEL
Parker	C Series
Nupro/Swagelok	4CP Series

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VALVE SPECIFICATION

CHECK / CLASS 150 / STAINLESS STEEL / WAFER

37NSFA (C71W)

BODY

Type:	Wafer Check
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Wafer, Flangeless
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	N/A
Options:	

TRIM

Disc Type:	Guided, Spring Assisted
Disc Material	316 Stainless Steel
Bore/Port:	Conventional
Seat:	Resilient, EPDM Food Grade
Stem:	316 SS
Spring:	316 SS

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

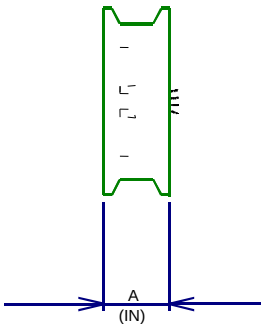
Design	ASME B16.34, API 594
End Prep	ASME B16.5
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2. NSF Certified
3.

DIMENSIONS

SIZE	A*		
½	0.63		
¾	0.74		
1	0.87		
1¼	1.10		
1½	1.26		
2	1.57		
2½	1.81		
3	1.97		
4	2.36		
6	4.19		
8	5.50		



MANUFACTURER	MODEL
Flomatic	812X

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VALVE SPECIFICATION

CHECK / CLASS 150 / DUCTILE IRON / FLANGED

38GF (C81N)

BODY

Type:	Check
Material:	Ductile Iron A395 or A536, PFA Lined
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted, two-piece
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Ball Check
Disc Material	Solid PTFE
Bore/Port:	Full
Seat:	Integral
Stem:	N/A
Seal/Packing:	N/A

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	N/A
Options:	

STANDARDS

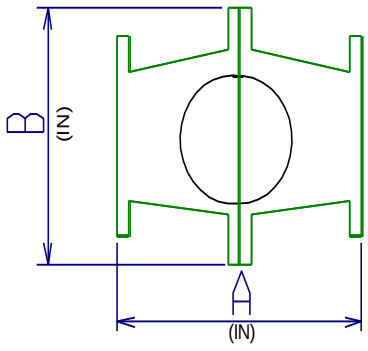
Design	ASME B16.42
End Prep	ASME B16.5, B16.42
Pressure Rating	ASME B16.42
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	
½	5.12	4	
3/4	5.91	4	
1	6.00	6	
1½	7.00	7	
2	8.00	8	
3	9.50	10	
4	11.50	12	
6	14.00	16	
8	18.00	21	



MANUFACTURER	MODEL
ChemValve	880-150
Duriron/Atomac	ARV-2
Tufline	XLC-13B

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VALVE SPECIFICATION

KNIFE GATE / CLASS 150 / RUBBER LINED/ LUGGED

41BA (K21V)

BODY

Type:	Knife Gate
Material:	Rubber lined, Ductile Iron A395
End Prep:	Lugged
Pressure Class:	150 psig CWP
Bonnet:	Bonnetless, OS&Y
Coating:	Mfg. Std.
Options:	Lock Pin Lockout

TRIM

Disc Type:	Knife Gate
Disc Material	Stainless Steel Type AL6XN (UNS N08367)
Bore/Port:	Full Port
Seat:	Gum Rubber
Stem:	Stainless Steel Type 316
Seal/Packing:	Gum Rubber

OPERATOR

Type:	Rising Stem
Handwheel:	10” and Smaller
Gear Operator:	12” and Larger
Lever:	N/A
Options:	

STANDARDS

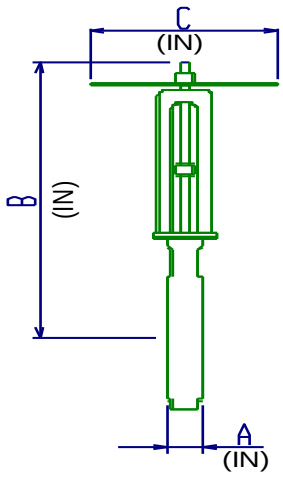
Design	Mfg. Std.
End Prep	ASME B16.5
Pressure Rating	150 psi 2” thru 16”, 90 psi 18” thru 24”
Dimensional	Manufacturer Standard
Marking:	MSS-SP-25
Testing:	Mfg. Std.

NOTES

1. * Verify dimensions with manufacturer
2. Unidirectional seat requires correct orientation at installation.
3.

DIMENSIONS

SIZE	A*	B*	C*
2	2.25	20	12
3	2.44	23	12
4	2.44	25	12
6	2.68	30	16
8	3.19	35	20
10	3.25	42	20
12	3.50	48	16
14	3.50	53	24
16	4.00	57	24
18	4.06	67	24
20	5.13	72	24
24	5.19	86	24



MANUFACTURER	MODEL
Clarkson	KGD

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VALVE SPECIFICATION

KNIFE GATE / CLASS 150 / RUBBER LINED/ FLANGED

41BF (K21N)

BODY

Type:	Knife Gate
Material:	Rubber lined, Ductile Iron A395
End Prep:	Flanged
Pressure Class:	100 psig CWP
Bonnet:	Bonnetless, OS&Y
Coating:	Mfg. Std.
Options:	Lock Pin Lockout

TRIM

Disc Type:	Knife Gate
Disc Material	Stainless Steel AL6XN (UNS N08367) or 2205 (UNS S32205)
Bore/Port:	Full Port
Seat:	Gum Rubber
Stem:	Stainless Steel Type 316
Seal/Packing:	Gum Rubber

OPERATOR

Type:	Rising Stem
Handwheel:	10” and Smaller
Gear Operator:	12” and Larger
Lever:	N/A
Options:	

STANDARDS

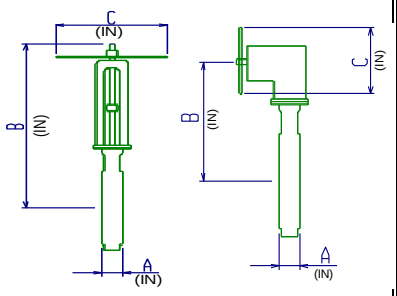
Design	Mfg. Std.
End Prep	ASME B16.5
Pressure Rating	100 psi 3” thru 24”
Dimensional	Manufacturer Standard
Marking:	MSS-SP-25
Testing:	Mfg. Std.

NOTES

1. * Verify dimensions with manufacturer
2. Unidirectional seat requires correct orientation at installation.
3.

DIMENSIONS

SIZE	A*	B*	C*
3	6.88	19	12
4	6.88	22	12
6	7.00	28	16
8	7.25	33	20
10	8.88	39	20
12	10.13	48	16
14	10.13	53	24
16	11.00	57	24
18	12.25	67	24
20	14.13	72	24
24	14.63	86	24



MANUFACTURER	MODEL
Clarkson	KGA

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	15Apr21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

PLUG / CLASS 150 / DUCTILE IRON / FLANGED

51AF (P11N)

BODY

Type:	Plug
Material:	Ductile Iron A395
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Sleeve-Lined Plug
Disc Material	316 SS A351 CF8M
Bore/Port:	Conventional
Seat:	Renewable PTFE Sleeve
Stem:	Ductile Iron A395
Seal/Packing:	

OPERATOR

Type:	Wrench operator for 4” and smaller
Handwheel:	Yes
Gear Operator:	Enclosed gear for 6” and larger
Lever:	N/A
Options:	

STANDARDS

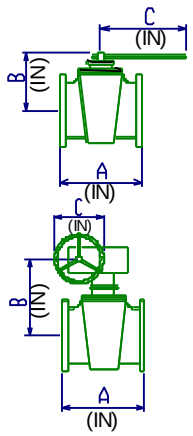
Design	API 599, ASME B16.34
End Prep	ASME B16.42
Pressure Rating	ASME B16.34
Dimensional	ASME B16.10
Marking:	ASME B16.34
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
1	*5.00	4	7
1½	6.50	5	9
2	7.00	6	12
3	8.00	6	18
4	9.00	8	30
6	10.50	15	12
8	11.50	14	18
10	13.00	17	18
12	14.00	19	18



MANUFACTURER	MODEL
Durco/Flowserve	G4-11 CD1T
Flouroseal	R152F DI 316 P
Tufline (Xomox)	067 16 P1

CHECKED:	CKF	DATE:	07Apr21	REVISED:	CKF	DATE:	07Apr21	PROJECT:	245891
APPROVED:	TCS	DATE:	07Apr21	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

PLUG / CLASS 150 / DUCTILE IRON/ FLANGED

58AF (P81N)

BODY

Type:	Tapered Plug
Material:	Ductile Iron ASTM A395, PFA Lined
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	Bolted
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	PFA-Lined Taper Plug
Disc Material	Ductile Iron ASTM A395, PFA Lined
Bore/Port:	Conventional
Seat:	PFA
Stem:	Ductile Iron ASTM A395
Seal/Packing:	Grounding Spring

OPERATOR

Type:	Wrench operator for 4” and smaller
Handwheel:	N/A
Gear Operator:	Enclosed gear for 6” and larger
Lever:	Yes
Options:	

STANDARDS

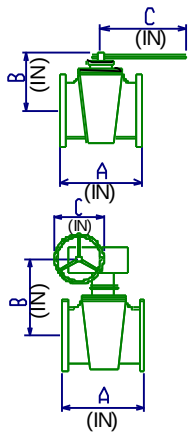
Design	API 599, ASME B16.34, B16.42
End Prep	ASME B16.5
Pressure Rating	ASME B16.42
Dimensional	ASME B16.10 Short Pattern
Marking:	ASME B16.25
Testing:	API 598
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
1/2	4.25*	3	8
3/4	4.63*	3	8
1	5.00	4	8
1½	6.50	5	12
2	7.00	6	17
3	8.00	6	23
4	9.00	8	29
6	10.50	15	18
8	11.50	14	18
10	13.00	17	24
12	14.00	19	24



MANUFACTURER	MODEL
Durco	T4E1
Tufline (Xomox)	061

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	07Apr21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / CLASS 150 / CARBON STEEL / FLANGED

64AF (B41N)

BODY

Type:	Floating Ball
Material:	Carbon Steel A216 Gr WCB
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	Mfg Std
Options:	1-piece or 2-piece body

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel Type 316
Bore/Port:	Standard Port
Seat:	Renewable, Reinforced PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	Plastic, TFE

OPERATOR

Type:	Quarter Turn
Handwheel:	N/A
Gear Operator:	6” NPS and larger
Lever:	4” NPS and smaller
Options:	Locking Device

STANDARDS

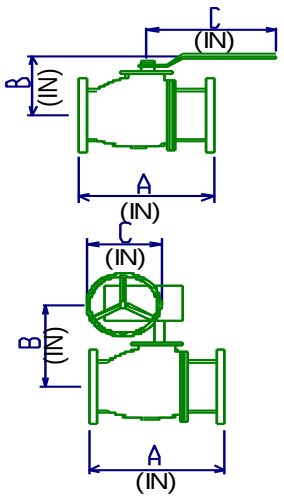
Design	ASME B16.34
End Prep	ASME B16.5
Pressure Rating	ASME CB16.34
Dimensional	ASME B16.10
Marking:	MSS SP-25
Testing:	ASME B16.34

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3.

DIMENSIONS

SIZE	A	B*	C*
½	4.25	4	6
¾	4.62	4	6
1	5.00	4	9
1½	6.50	5	9
2	7.00	6	9
2½	7.50	5	8
3	8.00	8	14
4	9.00	8	14
6	10.50	14	12
8	11.50	17	12
10	13.00	20	12
12	14.00	20	12



MANUFACTURER	MODEL
Apollo	88A-100
Marpac	ERP1-CS-R-T-S6 DEC
Neles-Jamesbury	7150-11-2236-MTT
Velan	F-00302-SSGA

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	07Apr21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / 1500 WOG / CARBON STEEL / SOCKET WELD

64HS (B43S)

BODY

Type:	3-Piece Ball
Material:	Carbon Steel A216 WCB/A105
End Prep:	Socket Weld
Pressure Class:	Body 1500 WOG
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Full Port
Seat:	Renewable, Reinforced PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

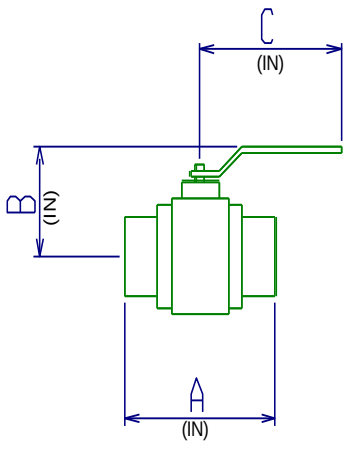
Design	ASME B16.34, API 608
End Prep	ASME B16.11
Pressure Rating	API 608, ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
½	2.80	3	6
¾	3.68	4	6
1	4.19	5	7
1¼	4.50	5	7
1½	4.98	5	7
2	5.86	6	9



MANUFACTURER	MODEL
Apollo	83A-240
Neles Jamesbury	4D-X-22-36-RT-1
PBV	C-6-3-33-0-9-22-36-G-T-S-L
Worcester	F608-4-6-R-T-SW

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / 1500 WOG / CARBON STEEL / SW x THRD

64HST (B43ST)

BODY

Type:	3-Piece Ball
Material:	Carbon Steel A216 WCB/A105
End Prep:	Socket Weld Inlet x Threaded Outlet
Pressure Class:	Body 1500 WOG
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Full Port
Seat:	Renewable, Reinforced PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

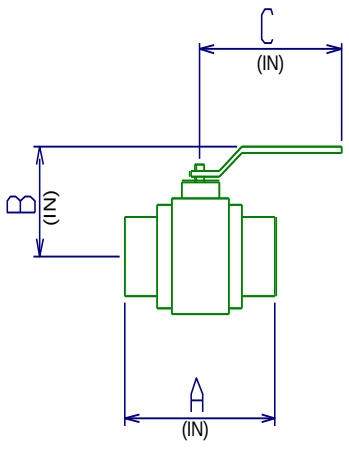
Design	ASME B16.34, API 608
End Prep	ASME B16.11
Pressure Rating	API 608, ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
½	2.80	3	6
¾	3.68	4	6
1	4.19	5	7
1¼	4.50	5	7
1½	4.98	5	7
2	5.86	6	9



MANUFACTURER	MODEL
Apollo	83A-240
Neles Jamesbury	4N-X-22-36-RT-1
Worcester	F608-4-6-R-T-SW x SE

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / CLASS 1500 / STAINLESS STEEL / COMPRESSION

67ER (B75X)

BODY

Type:	1-Piece Ball
Material:	Stainless Steel A351 Gr CF3M
End Prep:	Compression Type
Pressure Class:	3000 psig CWP
Bonnet:	Threaded
Coating:	N/A
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel Type 316
Bore/Port:	Regular Port
Seat:	Renewable Plastic, Reinforced TFE
Stem:	Stainless Steel Type 316
Seal/Packing:	Plastic TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

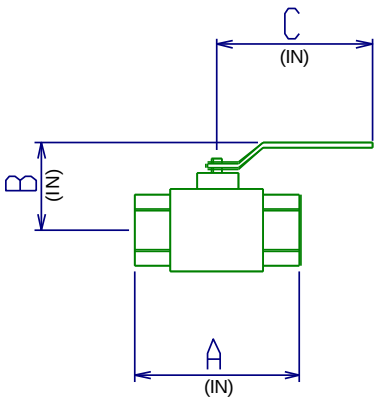
Design	ASME B16.34
End Prep	Mfg Std
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A*	B*	C*
¼	2.21	2	2
⅜	2.58	2	2
½	3.92	3	3
¾	3.92	3	3



MANUFACTURER	MODEL
Hoke	7022
Parker	B6L-J-SSP
Whitey/Swagelok	40G Series

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / 1500 WOG / STAINLESS STEEL / SOCKET WELD

67HS (B73S)

BODY

Type:	3-Piece Ball
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Socket Weld
Pressure Class:	Body 1500 WOG
Bonnet:	N/A
Coating:	N/A
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Full Port
Seat:	Renewable, Reinforced PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

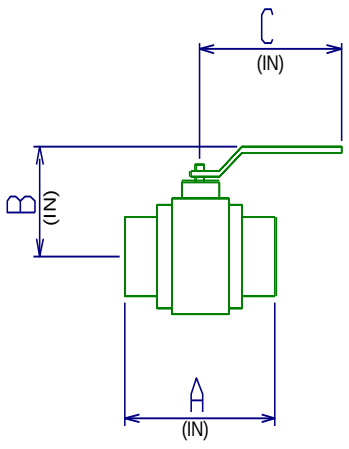
Design	ASME B16.34, API 608
End Prep	ASME B16.11
Pressure Rating	API 608, ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3.

DIMENSIONS

SIZE	A*	B*	C*
½	2.80	3	6
¾	3.68	4	6
1	4.19	5	7
1¼	4.50	5	7
1½	4.98	5	7
2	5.86	6	9



MANUFACTURER	MODEL
Apollo	86A-200
Neles Jamesbury	4D-36-36-BT
Sharpe	9966RTSW
Worcester	59-6-6-R-T-SW

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / 1500 WOG / STAINLESS STEEL / SW x THRD

67HST (B73ST)

BODY

Type:	3-Piece Ball
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Socket Weld Inlet x Threaded Outlet
Pressure Class:	Body 1500 WOG
Bonnet:	N/A
Coating:	N/A
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Full Port
Seat:	Renewable, Reinforced PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

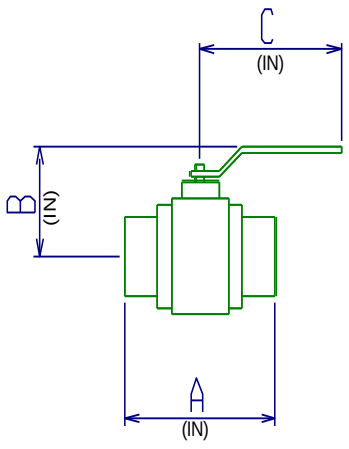
Design	ASME B16.34, API 608
End Prep	ASME B16.11
Pressure Rating	API 608, ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3.

DIMENSIONS

SIZE	A*	B*	C*
½	2.80	3	6
¾	3.68	4	6
1	4.19	5	7
1¼	4.50	5	7
1½	4.98	5	7
2	5.86	6	9



MANUFACTURER	MODEL
Apollo	86A-200
Neles Jamesbury	4N-36-36-BT
Sharpe	9966RTSW x TE
Worcester	59-6-6-R-T-SW x TE

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
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VALVE SPECIFICATION

BALL / CLASS 600 / STAINLESS STEEL / SOCKET WELD

67NSFS (B73S)

BODY

Type:	3-Piece Ball
Material:	Stainless Steel A351 Gr CF8M
End Prep:	Socket Weld
Pressure Class:	Body Class 600
Bonnet:	N/A
Coating:	N/A
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel A351 Gr CF8M
Bore/Port:	Full Port
Seat:	Renewable, Reinforced TFE
Stem:	Stainless Steel Type 316
Seal/Packing:	Graphite

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

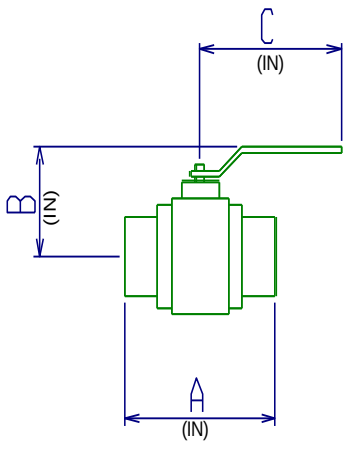
Design	ASME B16.34, API 608
End Prep	ASME B16.11
Pressure Rating	API 608, ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25, NSF
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3. Valve shall be NSF Approved

DIMENSIONS

SIZE	A*	B*	C*
½	2.80	3	6
¾	3.68	4	6
1	4.19	5	7
1¼	4.50	5	7
1½	4.98	5	7
2	5.86	6	9



MANUFACTURER	MODEL
Apollo	86B-200

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / CLASS 150 / STAINLESS STEEL / FLANGED

67RF (B71N)

BODY

Type:	Top Entry
Material:	Stainless Steel AL6XN, A351 CN3MN
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Ball
Disc Material	Stainless Steel AL6XN
Bore/Port:	Full Port
Seat:	Renewable, UHMWPE
Stem:	Stainless Steel AL6XN
Internal Spring	

OPERATOR

Type:	Quarter Turn
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

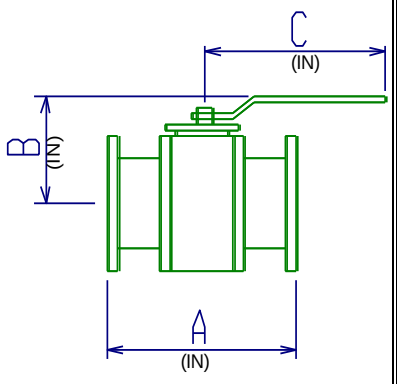
Design	ASME B16.34
End Prep	ASME B16.5
Pressure Rating	ASME B16.34
Dimensional	Mfg Std
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2. Valve for on-off slurry service only. Not for metering
3.

DIMENSIONS

SIZE	A*	B*	C*
1	7.00	6	7
1½	8.75	7	9
2	10.5	9	18
3	13.5	10	30



MANUFACTURER	MODEL
Apollo	RREU 24
McCanna	S151 AL6XN P Slurry

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BALL / CLASS 150 / DUCTILE IRON / FLANGED

68GF (B81N)

BODY

Type:	2-Piece Ball
Material:	Ductile Iron A395, PFA Lined
End Prep:	Flanged
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Ball
Disc Material	Ductile Iron A394, PFA Coated
Bore/Port:	Full Port
Seat:	Renewable, PTFE
Stem:	Stainless Steel Type 316
Seal/Packing:	Plastic, TFE

OPERATOR

Type:	Quarter Turn
Handwheel:	N/A
Gear Operator:	N/A
Lever:	Yes
Options:	Locking Mechanism

STANDARDS

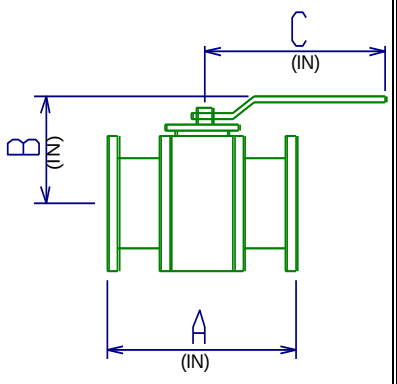
Design	ASME B16.34, B16.42
End Prep	ASME B16.5, B16.42
Pressure Rating	ASME B16.42
Dimensional	ASME B16.10
Marking:	MSS SP-25
Special:	

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
½	4.25	5	7
¾	4.61	5	7
1	5.00	5	7
1½	6.50	6	8
2	7.00	7	8
3	8.00	8	13
4	9.00	11	13
6	10.50	16	20



MANUFACTURER	MODEL
Amri	FF-3f6f6fT (1/2”-4”) and FF-3f6f3fT (6”)
Atomac	AKH2A
NeoTecha	NTB-NB2-F-A1-L-00
Xomox	Tufline XLB-12A

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Mar21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BUTTERFLY / CLASS 150 / DUCTILE IRON / LUGGED

71AA (F11V)

BODY

Type:	Butterfly
Material:	Ductile Iron A536 or A395
End Prep:	Lugged, Class 150
Pressure Class:	200 psig CWP (2”-12”), 150 psig CWP (14”-36”)
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Concentric Bi-Directional
Disc Material	Stainless Steel Type 316
Bore/Port:	Conventional Port
Seat:	Renewable, Resilient, Buna-N
Stem:	Stainless Steel Type 316
Seal/Packing:	NBR

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	6” and larger
Lever:	4” and smaller
Options:	Locking Mechanism on Lever

STANDARDS

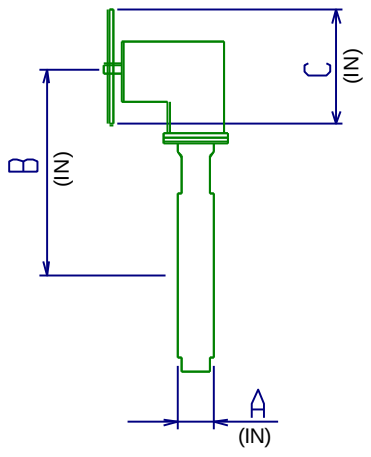
Design	MSS SP-67 Type I, API 609 Category A
End Prep	ASME B16.5
Pressure Rating	API 609
Dimensional	API 609
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. 180ºF temperature limit
3.

DIMENSIONS

SIZE	A	B	C
2	1.62	7	11
2½	1.75	8	11
3	1.75	8	11
4	2.00	9	11
6	2.12	11	8
8	2.50	13	8
10	2.50	14	8
12	3.00	16	8
14	3.00	18	15
16	4.00	20	15
18	4.25	21	15
20	5.00	21	15
24	6.00	25	18
30	6.56	28	18
36	7.88	34	18
42	9.88	39	18
48	10.88	43	18



MANUFACTURER	MODEL
Centerline	Series 225
Demco	Series NE-C and Series NF-C
Keystone	AR2
Milwaukee	ML Series

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BUTTERFLY / CLASS 150 / DUCTILE IRON / LUGGED

71NSFA (F11V)

BODY

Type:	Butterfly
Material:	Ductile Iron A536 or A395
End Prep:	Lugged, Class 150
Pressure Class:	200 psig CWP (2”-12”), 150 psig CWP (14”-36”)
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Concentric Bi-Directional
Disc Material	Stainless Steel Type 316
Bore/Port:	Conventional Port
Seat:	Renewable, Resilient, Buna-N or EPDM
Stem:	Stainless Steel Type 316
Seal/Packing:	NBR

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	6” and larger
Lever:	4” and smaller
Options:	Locking Mechanism on Lever

STANDARDS

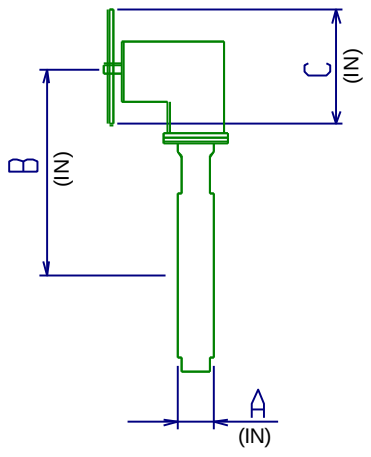
Design	MSS SP-67 Type I, API 609 Category A, NSF
End Prep	ASME B16.5
Pressure Rating	API 609
Dimensional	API 609
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. 180ºF temperature limit
3. NSF-61 Certified

DIMENSIONS

SIZE	A*	B*	C*
2	1.75	7	11
2½	1.88	8	11
3	1.88	8	11
4	2.13	9	11
6	2.25	11	8
8	2.50	13	8
10	2.75	14	8
12	3.13	16	8



MANUFACTURER	MODEL
Apollo	LD145 S N
Centerline	Series 200 CV04435 2/5 N

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BUTTERFLY / CLASS 150 / CARBON STEEL / FLANGED

74AA (F41V)

BODY

Type:	High Performance Butterfly
Material:	Carbon Steel A216 Gr WCB
End Prep:	Single Flange Lugged
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Double Offset, Bidirectional
Disc Material	Stainless Steel A351 CF8M
Bore/Port:	Conventional Port
Seat:	Renewable, Reinforced, RTFE
Stem:	Stainless Steel 17-4PH
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	8” and larger
Lever:	6” and smaller
Options:	Locking Mechanism for Lever

STANDARDS

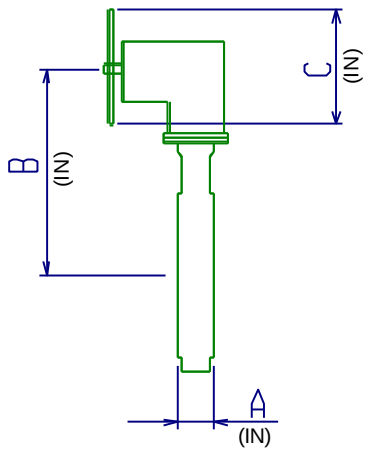
Design	MSS SP-68, API 609 Category B, ASME B16.34
End Prep	ASME B16.5, B16.47 Series A
Pressure Rating	ASME B16.34, API 609
Dimensional	MSS SP-68, API 609
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3.

DIMENSIONS

SIZE	A	B*	C*
2	*1.75	8	9
2½	*1.88	8	9
3	1.88	12	12
4	2.12	13	12
6	2.25	15	12
8	2.50	15	12
10	2.81	17	12
12	3.19	18	12
14	3.62	18	12
16	4.00	19	12
18	4.50	22	12
20	5.00	23	12
24	6.06	26	12
30	*6.56	30	12
36	*7.25	32	12
42	*8.75	41	12
48	*10.00	45	12



MANUFACTURER	MODEL
Keystone	F362 123
Neles Jamesbury	815-L-11-22-HB-MT
WKM	113-02-S02-11
Xomox Tufline	821-267-TT-ST2

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BUTTERFLY / CLASS 150 / STAINLESS STEEL / LUGGED

77AA (F71V)

BODY

Type:	High Performance Butterfly
Material:	Stainless Steel A351 CF8M
End Prep:	Single Flange Lugged
Pressure Class:	ASME Class 150
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Double Offset, Bidirectional
Disc Material	Stainless Steel A351 CF8M
Bore/Port:	Conventional Port
Seat:	Renewable, Reinforced, RTFE
Stem:	Stainless Steel 17-4PH
Seal/Packing:	TFE

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	6” and larger
Lever:	4” and smaller
Options:	Locking Mechanism for Lever

STANDARDS

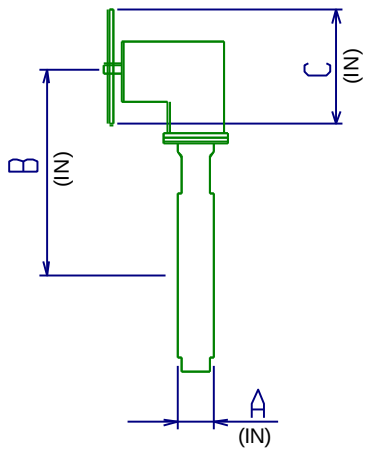
Design	MSS SP-68, API 609 Category B, ASME B16.34
End Prep	ASME B16.5, B16.47 Series A
Pressure Rating	ASME B16.34, API 609
Dimensional	MSS SP-68
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify dimensions with manufacturer
2. Valve pressure limited by seat rating
3.

DIMENSIONS

SIZE	A	B*	C*
2	*1.75	8	9
2½	*1.88	8	9
3	1.88	12	12
4	2.12	13	12
6	2.25	15	12
8	2.50	15	12
10	2.81	17	12
12	3.19	18	12
14	3.62	18	12
16	4.00	19	12
18	4.50	22	12
20	5.00	23	12
24	6.06	26	12
30	*6.56	30	12
36	*7.25	32	12
42	*8.75	41	12
48	*10.00	45	12



MANUFACTURER	MODEL
Keystone	F362 124
Neles Jamesbury	815-L-11-36-HB-MT
WKM	123-02-S02-11
Xomox Tufline	821-667-TT-ST2

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	MLT	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

BUTTERFLY / CLASS 150 / LINED DUCTILE IRON / LUGGED

78AA (F81V)

BODY

Type:	Fully Lined Butterfly
Material:	PFA Lined Ductile Iron A395
End Prep:	Flange Lugged
Pressure Class:	150 psig
Bonnet:	N/A
Coating:	Mfg Std
Options:	

TRIM

Disc Type:	Concentric Disc
Disc Material	PFA Encapsulated Stainless Steel
Bore/Port:	Conventional Port
Seat:	Integral PFA
Stem:	Stainless Steel
Seal/Packing:	PTFE / Viton

OPERATOR

Type:	N/A
Handwheel:	N/A
Gear Operator:	6” and larger
Lever:	4” and smaller
Options:	Locking Mechanism on Lever

STANDARDS

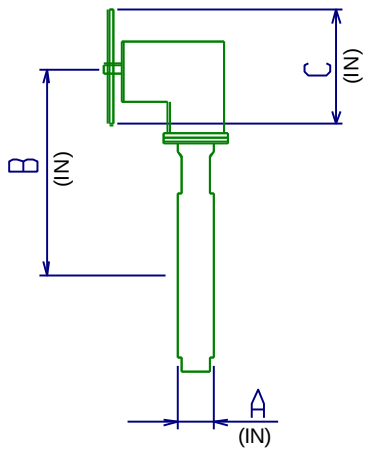
Design	MSS SP-67, API 609 Category A
End Prep	ASME B16.5
Pressure Rating	API 609
Dimensional	API 609
Marking:	MSS SP-25
Testing:	API 598

NOTES

1. * Verify Dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
2	1.69	6	14
3	1.81	7	14
4	2.06	8	14
6	2.19	11	8
8	2.38	12	12
10	2.69	14	12
12	3.06	15	12
14	3.06	17	14
16	4.00	18	18
18	4.50	21	18
20	5.00	22	18
24	6.06	24	18



MANUFACTURER	MODEL
Amri Acris	IL-31KF
Durco	BTL 418
Xomox	XLD21

CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

VALVE SPECIFICATION

PINCH / CLASS 125 / CAST IRON / FLANGED

98AF (H21N)

BODY

Type:	Pinch, Sleeve-Lined
Material:	Cast Iron A126 Cl B
End Prep:	Flanged
Pressure Class:	ASME Class 125
Bonnet:	Enclosed Body
Coating:	Mfg Std
Options:	

TRIM

Type:	Double Pinch Bars
Sleeve Material	Pure Gum Rubber
Bore/Port:	Full
Seat:	N/A
Stem:	Steel A108
Seal/Packing:	N/A

OPERATOR

Type:	Non-Rising Stem w/ Double Pinch Bars
Handwheel:	4” Diameter and Smaller
Gear Operator:	6” Diameter and Larger
Lever:	
Options:	

STANDARDS

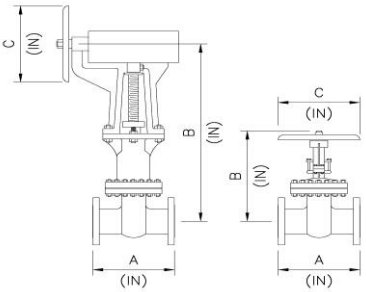
Design	MSS SP-70
End Prep	ASME B16.1
Pressure Rating	Mfg Std
Dimensional	ASME B16.10 thru 6” Dia
Marking:	MSS SP-25
Testing:	Mfg Std

NOTES

1. * Verify dimensions with manufacturer
2.
3.

DIMENSIONS

SIZE	A	B*	C*
1	5.50	11	6
1½	6.50	12	6
2	7.00	15	8
2½	7.50	17	12
3	8.00	17	12
4	9.00	18	12
6	10.50	25	18
8	16.00*	34	18
10	20.00*	37	18
12	24.00*	40	18
14	28.00*	42	18
16	32.00*	54	18
18	36.00*	55	18
20	40.00*	59	18



MANUFACTURER	MODEL
Florox	PVE M 10-60 NR
Red Valve*	Series 75

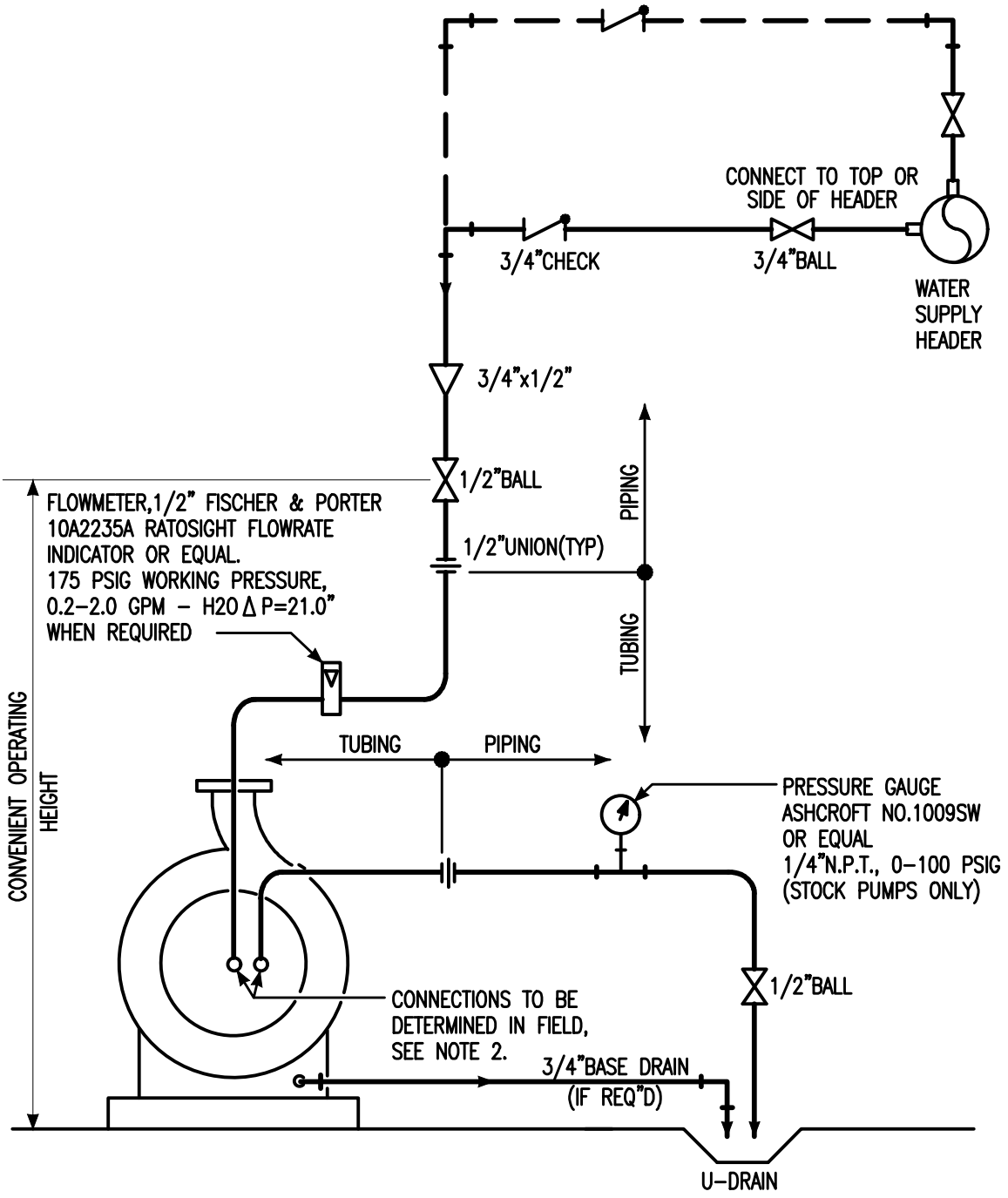
CHECKED:	CKF	DATE:	26Nov19	REVISED:	CKF	DATE:	19Feb21	PROJECT:	245891
APPROVED:	TCS	DATE:	26Nov19	ISSUED:		DATE:		REV:	0

Piping Specification

Title:	**Typical Piping Details**	
Project Doc. No.:	**TD-030-000**	Revision No.:

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING & VALVE SERVICE INDEX.
2. COOLING & SEAL WATER TO BE INSTALLED PER VENDOR CERTIFIED INSTALLATION, OPERATION & MAINTENANCE MANUAL.

1

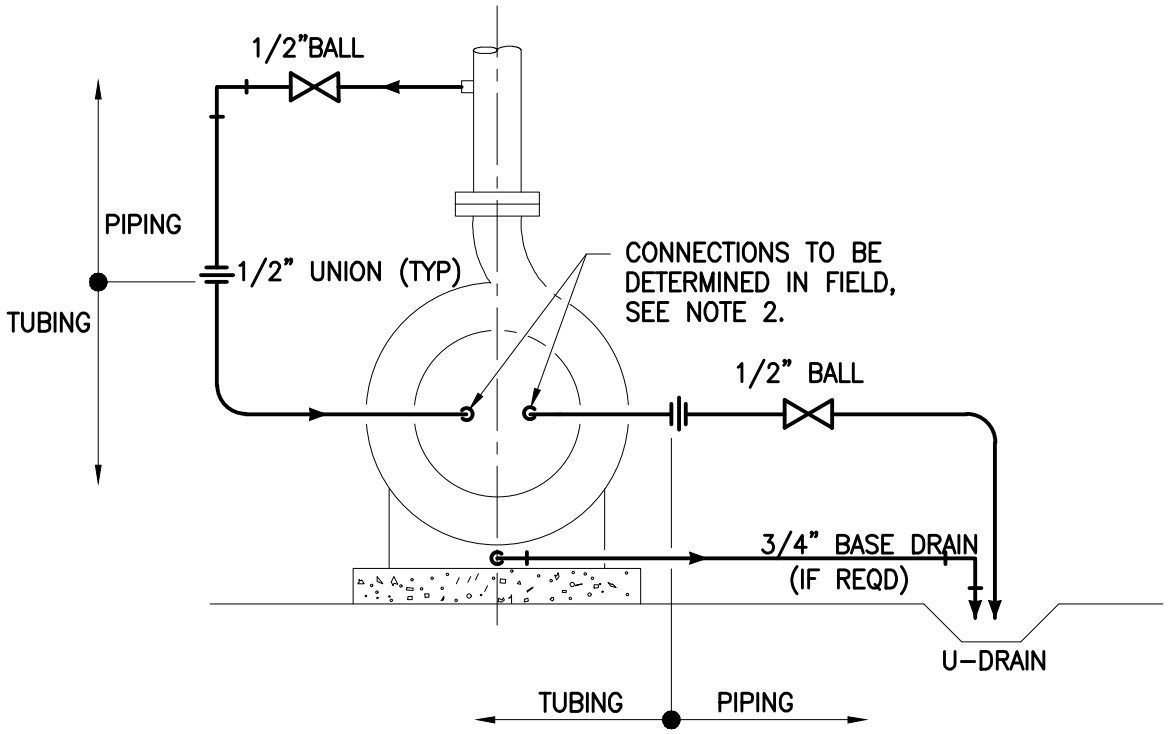
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	EXTERNAL SEAL WATER FOR END SUCTION PUMPS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-001		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING & VALVE SERVICE INDEX.
2. COOLING & SEAL WATER TO BE INSTALLED PER VENDOR CERTIFIED INSTALLATION, OPERATION & MAINTENANCE MANUAL.

2

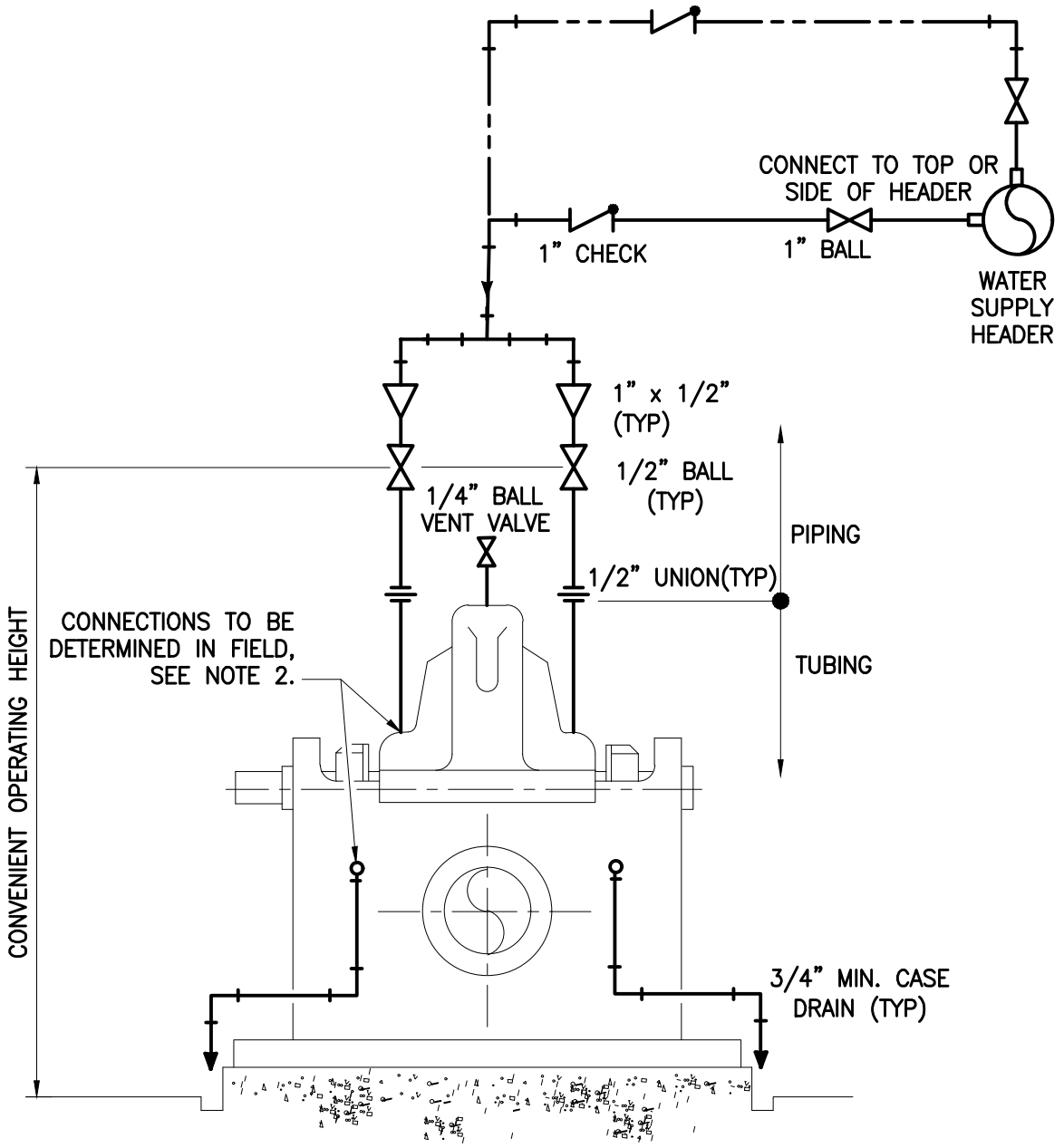
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	SEAL WATER FOR FRESH WATER END SUCTION PUMPS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-002		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING & VALVE SERVICE INDEX.
2. COOLING & SEAL WATER TO BE INSTALLED PER VENDOR CERTIFIED INSTALLATION, OPERATION & MAINTENANCE MANUAL.

3

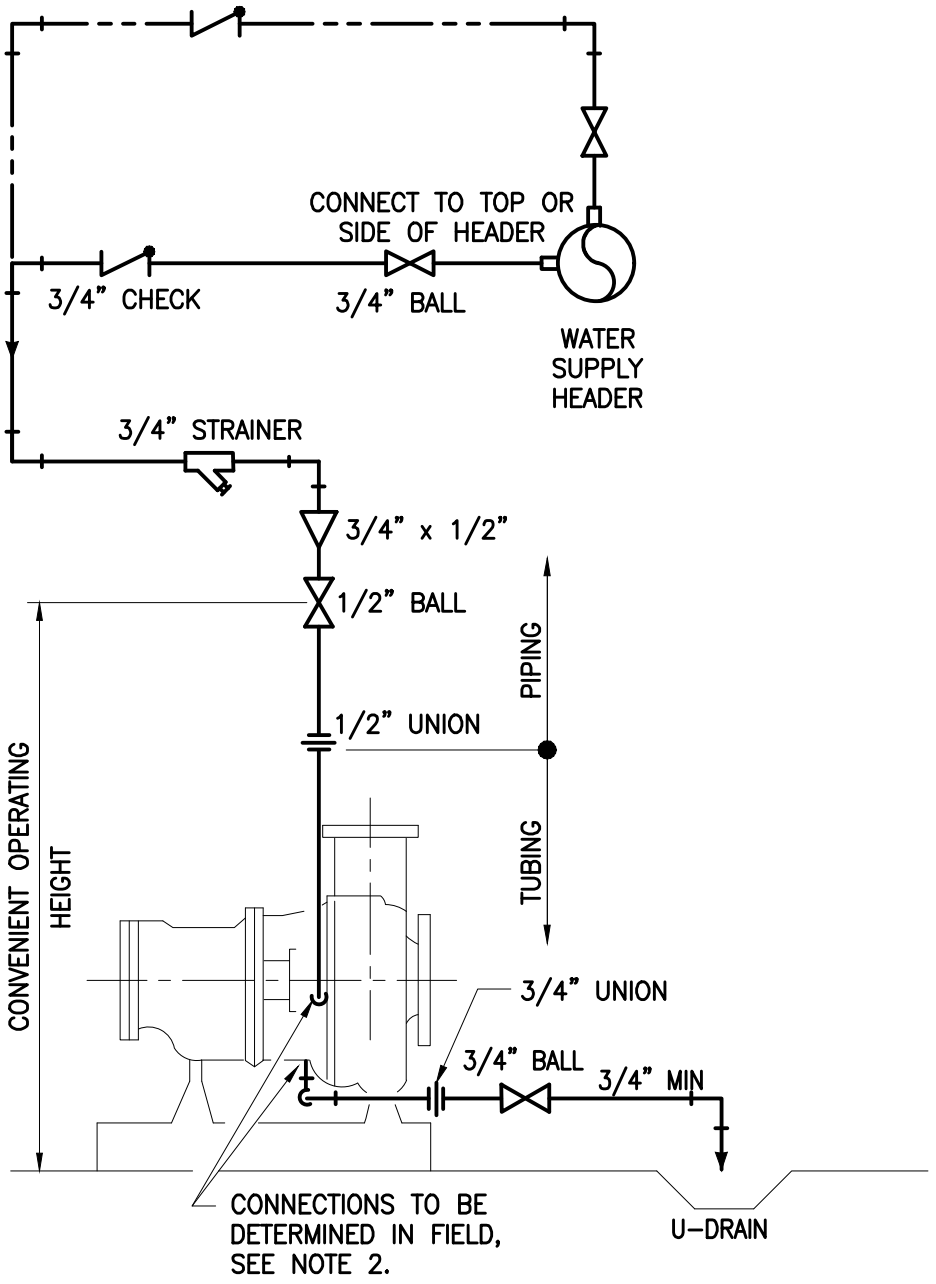
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	EXTERNAL SEAL WATER FOR DOUBLE SUCTION PUMPS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-003		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING & VALVE SERVICE INDEX.
2. COOLING & SEAL WATER TO BE INSTALLED PER VENDOR CERTIFIED INSTALLATION, OPERATION & MAINTENANCE MANUAL.

4

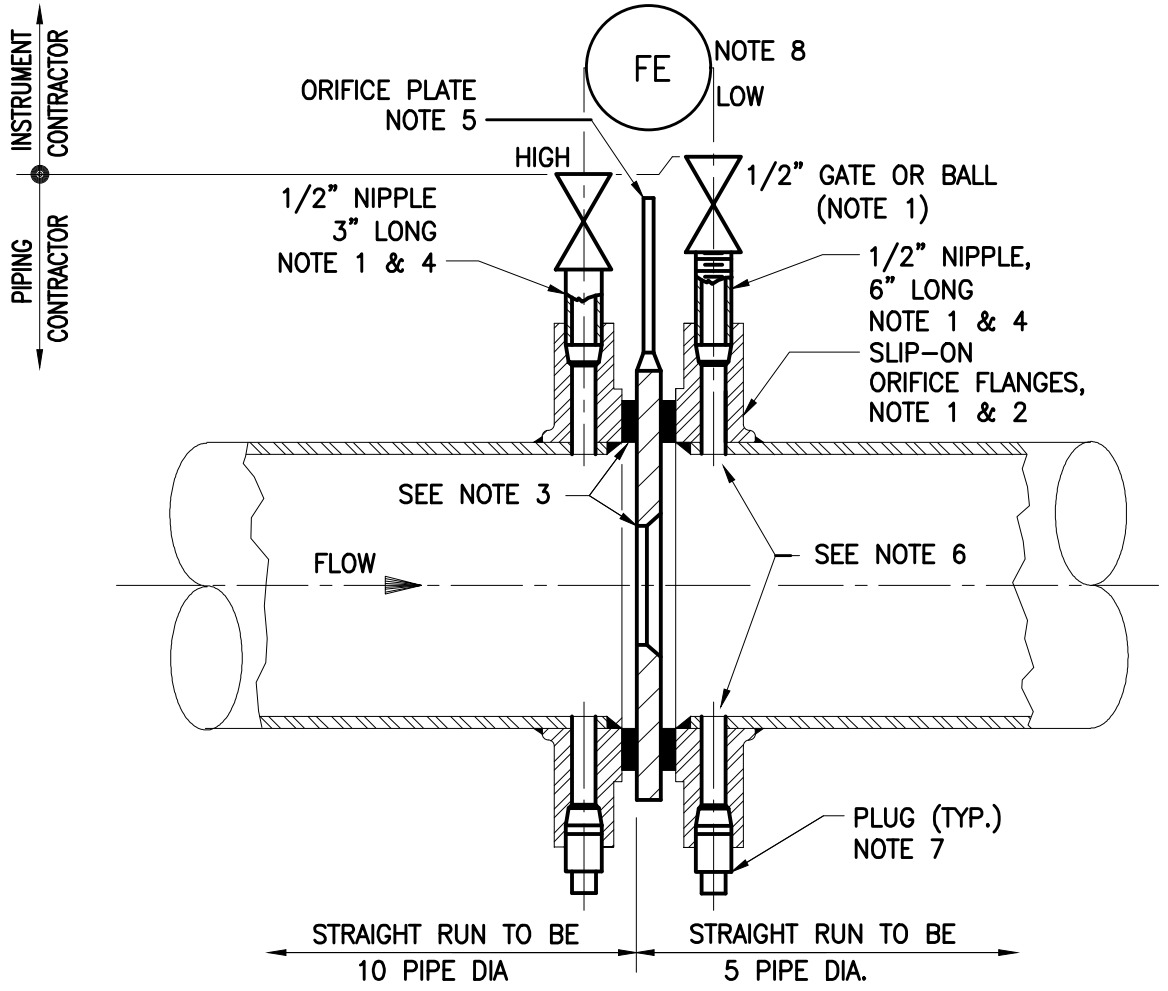
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	MECHANICAL SEAL FLUSH WATER FOR END SUCTION PUMPS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-004		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:

1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX, 300# FLANGE RATING MINIMUM.
2. CARE SHALL BE TAKEN THAT FLANGES ARE SQUARE & PERPENDICULAR TO THE PIPE AXIS. REMOVE ALL ROUGH SPOTS INSIDE THE PIPE AFTER WELDING.
3. ORIFICE PLATES SHALL HAVE GASKETS ON BOTH SIDES, WITH THE SHARP EDGE OF THE OPENING FACING UPSTREAM.
4. INSTRUMENT CONNECTIONS SHALL BE LOCATED IN THE SAME PLANE. IN HORIZONTAL PIPING RUNS LOCATE THE CONNECTIONS ON THE SIDE OF THE PIPE FOR STEAM OR WATER AND ON TOP OF THE PIPE FOR AIR AND GAS.
5. LOCATE THE ORIFICE TAB IN-LINE WITH THE INSTRUMENT CONNECTIONS, TEXT FACING UPSTREAM.
6. DRILL TO MATCH THE HOLE I.D. IN THE FLANGE USING THE FLANGE AS A TEMPLATE. AFTER INSTALLATION REMOVE ALL BURRS FROM HOLES.
7. PLUGS IN THE ORIFICE TAPS NOT USED SHALL BE REMOVED, CLEANED, LUBRICATED AND RE-INSTALLED.
8. SEE PIPING & INSTRUMENT DIAGRAM FOR LOOP NUMBER.

33

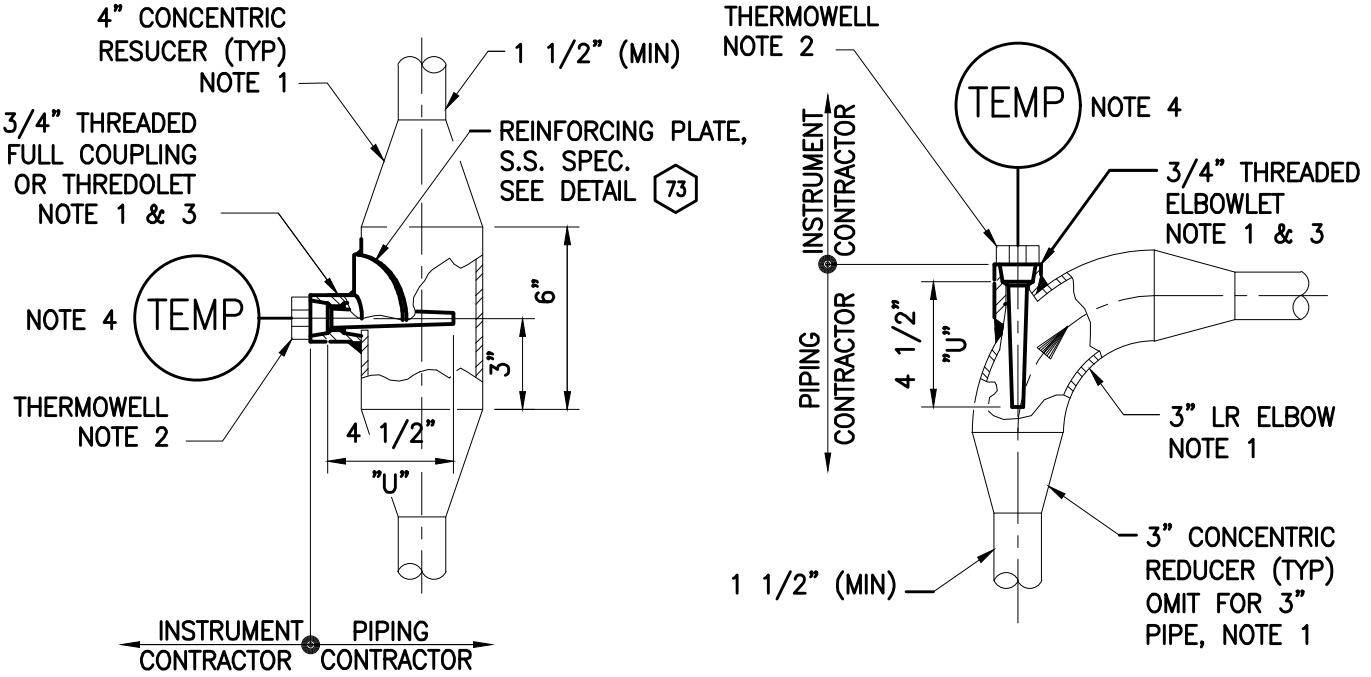
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	FLOW MEASURING ORIFICE PLATE WITH SLIP-ON FLANGES				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-033		REV: 0

ANSI A-8.5x11

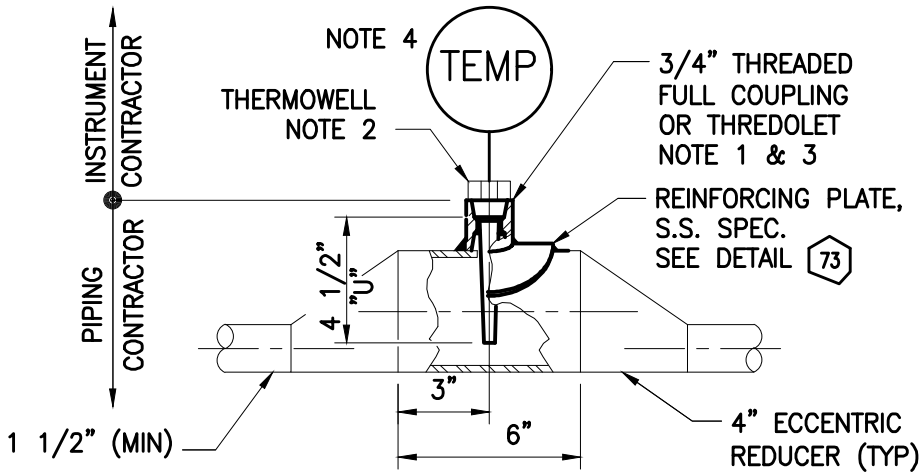
STANDARD DETAIL

wood.



VERTICAL PIPES

ELBOWS



HORIZONTAL PIPES

NOTES:

1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. CONTRACTOR SHALL VERIFY THAT THE "U" DIMENSION ON THE INSTRUMENT SPECIFICATION SHEET AGREES WITH THIS DETAIL.
3. CARE SHALL BE TAKEN THAT FITTINGS ARE SQUARE AND PERPENDICULAR TO THE PIPE AXIS. REMOVE ROUGH SPOTS INSIDE THE PIPE AFTER WELDING AND DRILLING.
4. SEE PIPING & INSTRUMENT DIAGRAM FOR LOOP NUMBER.

37

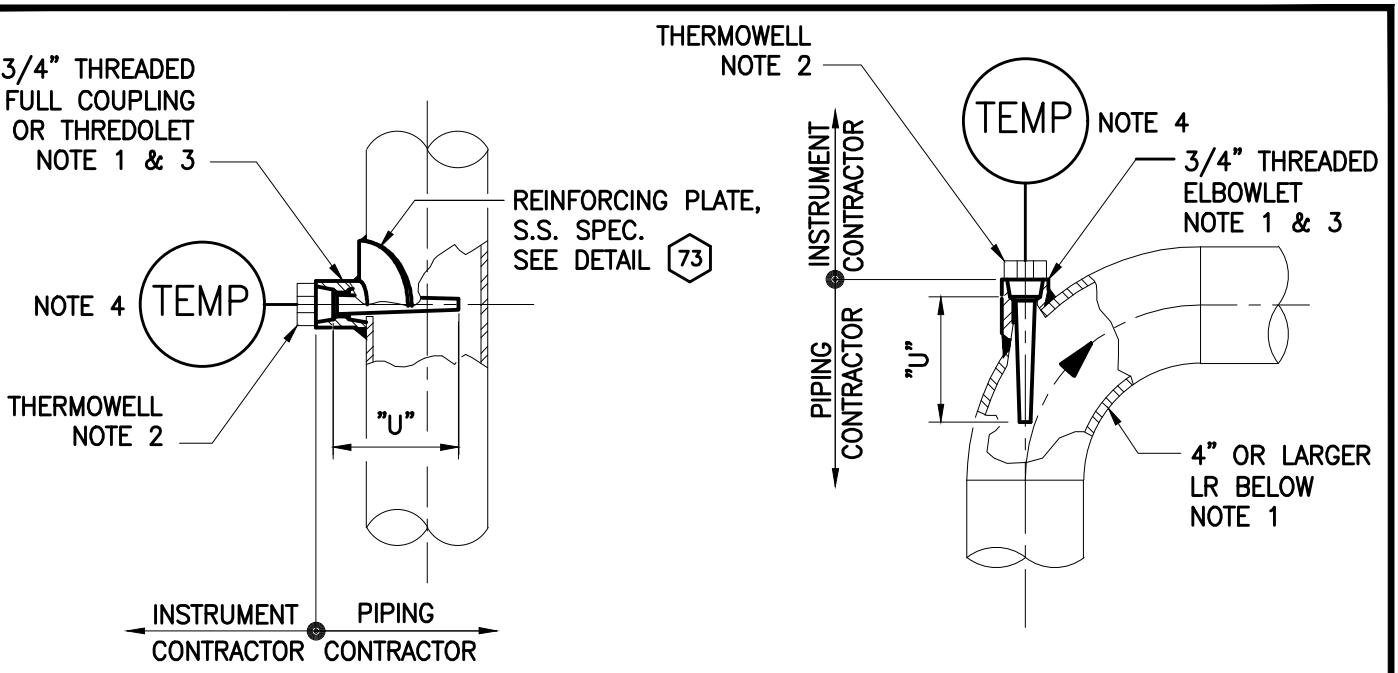
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	THERMOWELL IN 3" PIPE AND SMALLER				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-037		REV: 0

ANSI A-8.5x11

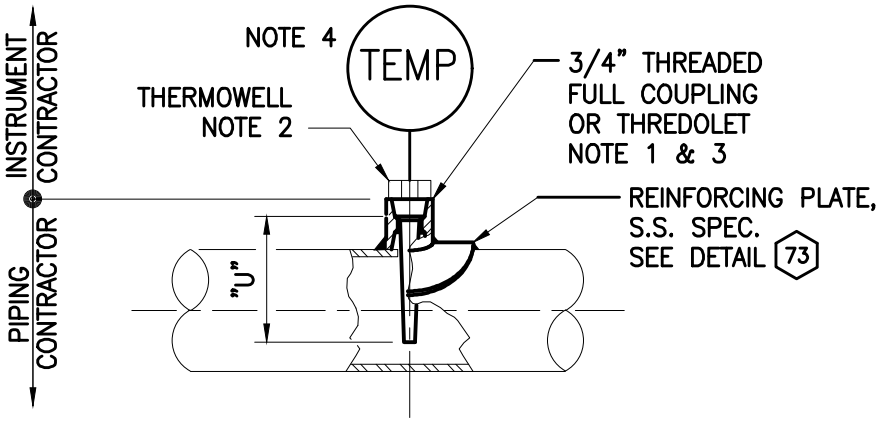
STANDARD DETAIL

wood.



VERTICAL PIPES

ELBOWS



HORIZONTAL PIPES

NOTES:

1. PIPE, VALVES & FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. CONTRACTOR SHALL VERIFY THAT THE "U" DIMENSION ON THE INSTRUMENT SPECIFICATION SHEET AGREES WITH THE THERMOWELL SUPPLIED.
3. CARE SHALL BE TAKEN THAT FITTINGS ARE SQUARE AND PERPENDICULAR TO THE PIPE AXIS. REMOVE ROUGH SPOTS INSIDE THE PIPE AFTER WELDING AND DRILLING.
4. SEE PIPING & INSTRUMENT DIAGRAM FOR LOOP NUMBER.

38

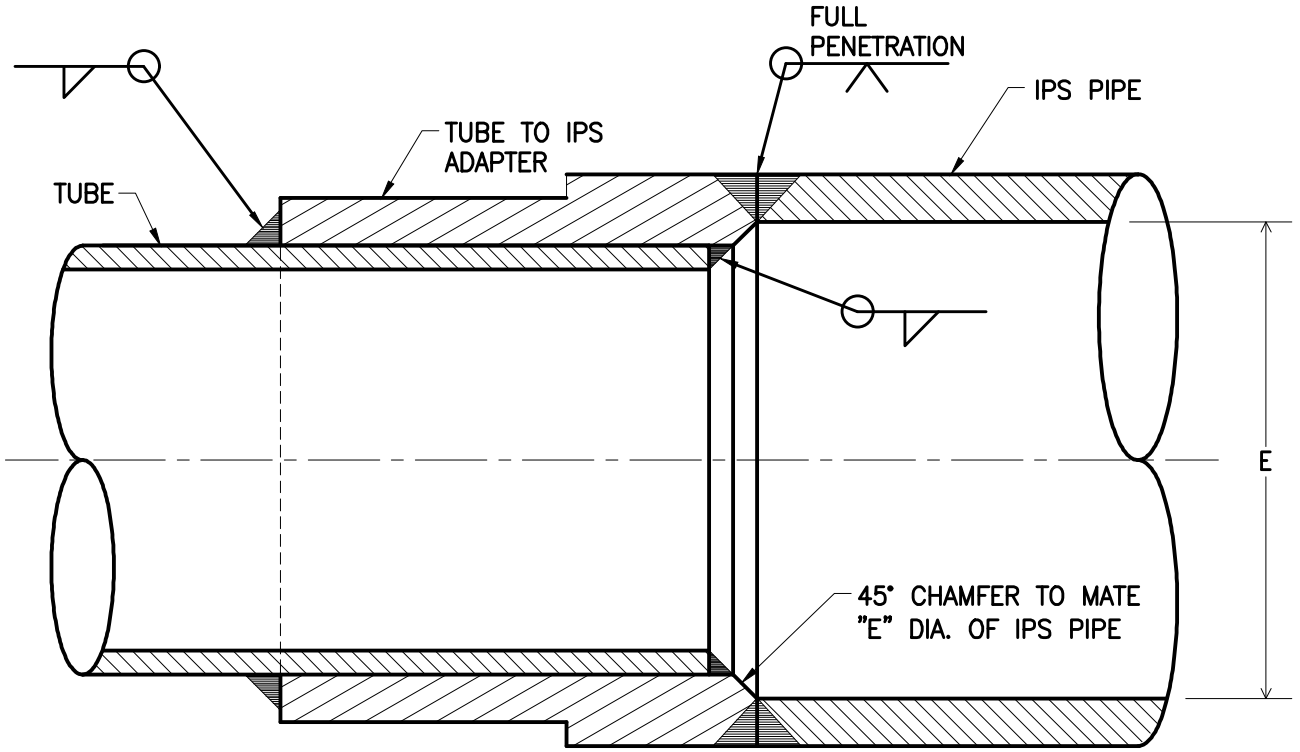
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	THERMOWELL IN 4" PIPE AND LARGER				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-038		REV: 0

ANSI A-8.5x11

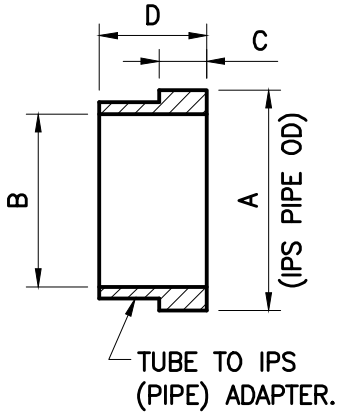
STANDARD DETAIL

wood.



DIMENSIONS

NOM SIZE	A	B	C	D
1"	1.315	1.010	5/8"	1 1/8"
1 1/4"	1.660	1.260	5/8"	1 1/8"
1 1/2"	1.900	1.510	5/8"	1 1/8"
2"	2.375	2.010	5/8"	1 1/8"
2 1/2"	2.875	2.510	5/8"	1 1/8"
3"	3.500	3.010	5/8"	1 1/8"
3 1/2"	4.000	3.510	5/8"	1 1/8"
4"	4.500	4.010	5/8"	1 1/8"
6"	6.625	6.010	5/8"	1 1/8"
8"	8.625	8.020	3/4"	1 5/16"
10"	10.750	10.020	3/4"	1 3/8"
12"	12.750	12.020	3/4"	1 3/8"



NOTES:
1. FITTING MATERIAL TO AGREE WITH PIPING AND VALVE SERVICE INDEX.

71

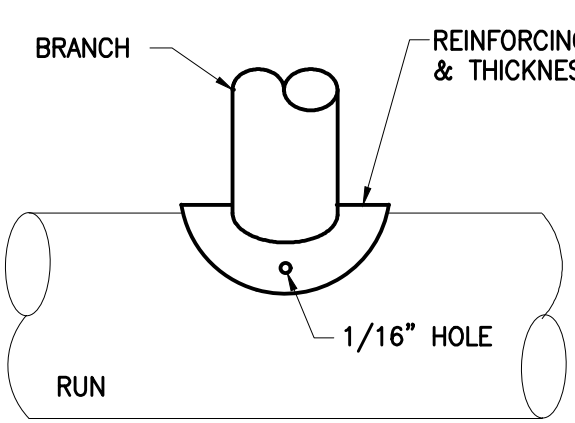
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	TUBE TO IPS PIPE ADAPTER				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-071		REV: 0

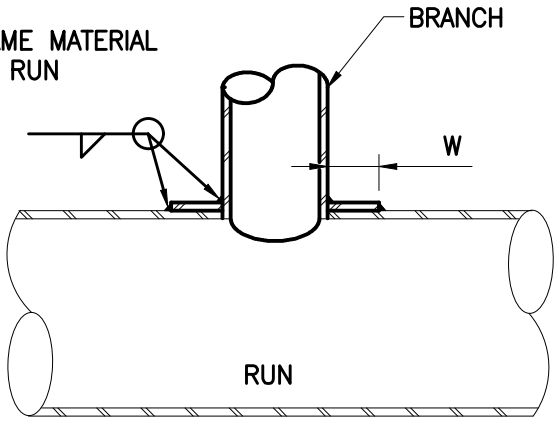
ANSI A-8.5x11

STANDARD DETAIL

wood.



BRANCH WITH
REINFORCING PLATE



SECTION

BRANCH SIZE	W=REINFORCING PL WIDTH
UP TO 2"	1"
3"	1-1/2"
4"	2"
6"	3"
8"	4"
10"	5"
12" & UP	6"

NOTES:
1. APPLIES TO SCH 10S AND LIGHTER AND STANDARD WEIGHT PIPE.

73

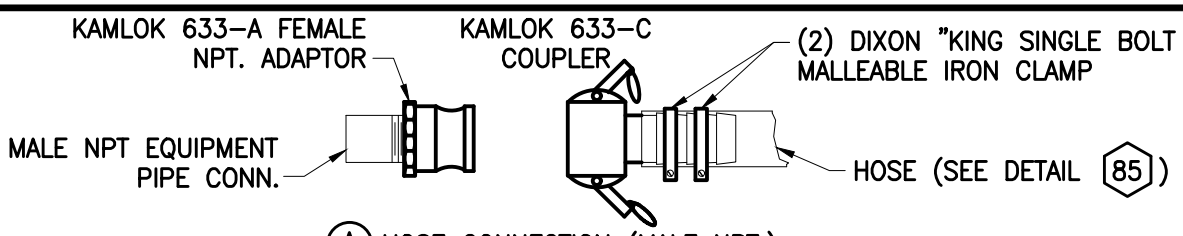
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	NOZZLE WELD REINFORCING PLATE				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-073		REV: 0

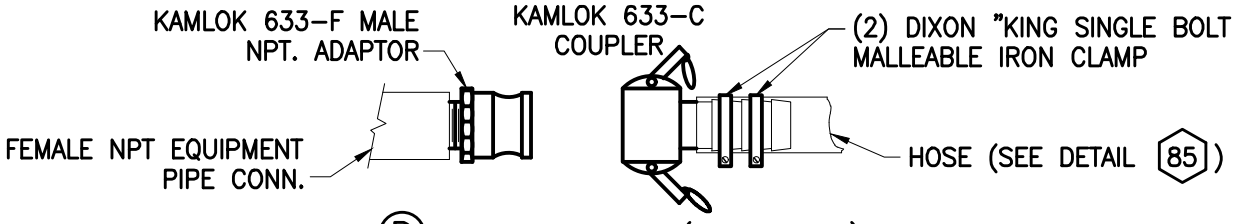
ANSI A-8.5x11

STANDARD DETAIL

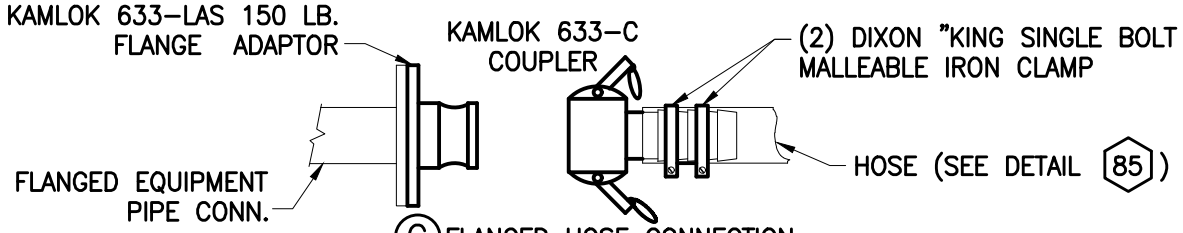
wood.



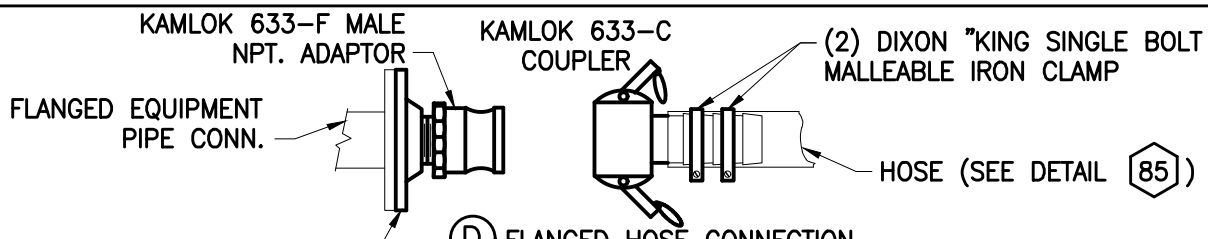
(A) HOSE CONNECTION (MALE NPT.)
3/4"-4"



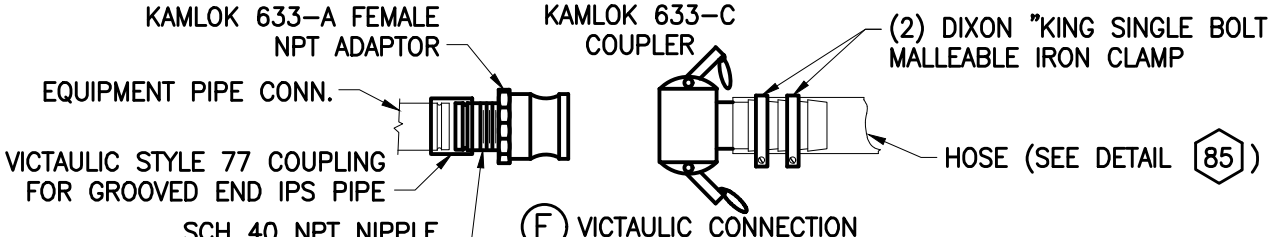
(B) HOSE CONNECTION (FEMALE NPT.)
3/4"-4"



(C) FLANGED HOSE CONNECTION
1"-3"



(D) FLANGED HOSE CONNECTION
4"



(E) VICTAULIC CONNECTION
3/4"-4"

NOTES:
1. PIPE AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. PRESSURE LIMITED TO 150 PSIG MAX.

86

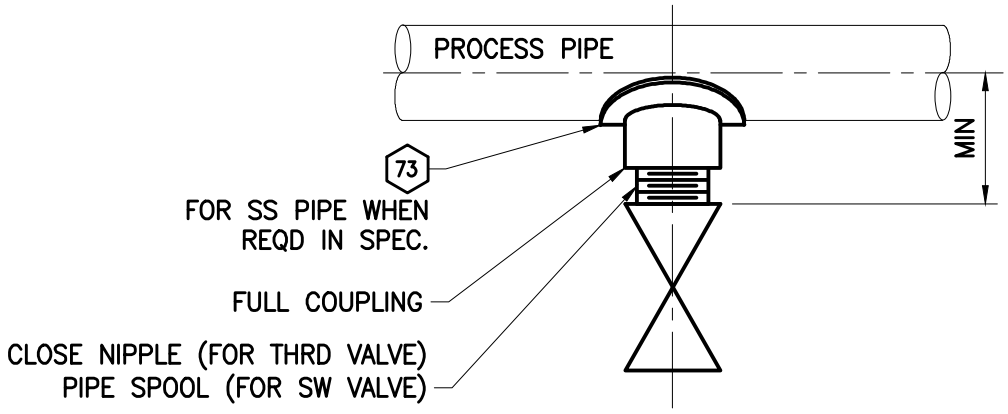
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	EQUIPMENT HOSE CONNECTIONS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-086		REV: 0

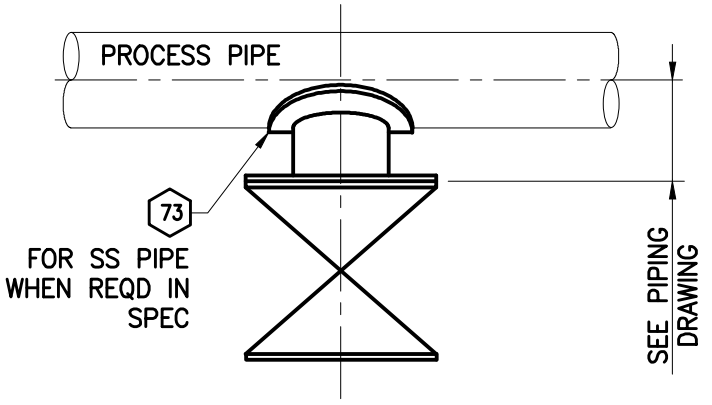
ANSI A-8.5x11

STANDARD DETAIL

wood.



THREADED VALVES OR SOCKET WELD VALVES



FLANGED VALVES

NOTES:
1. PIPE, VALVES AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. FOR ORIENTATION, PIPE SPEC, AND PIPE SIZES SEE PIPING DRAWINGS.

103

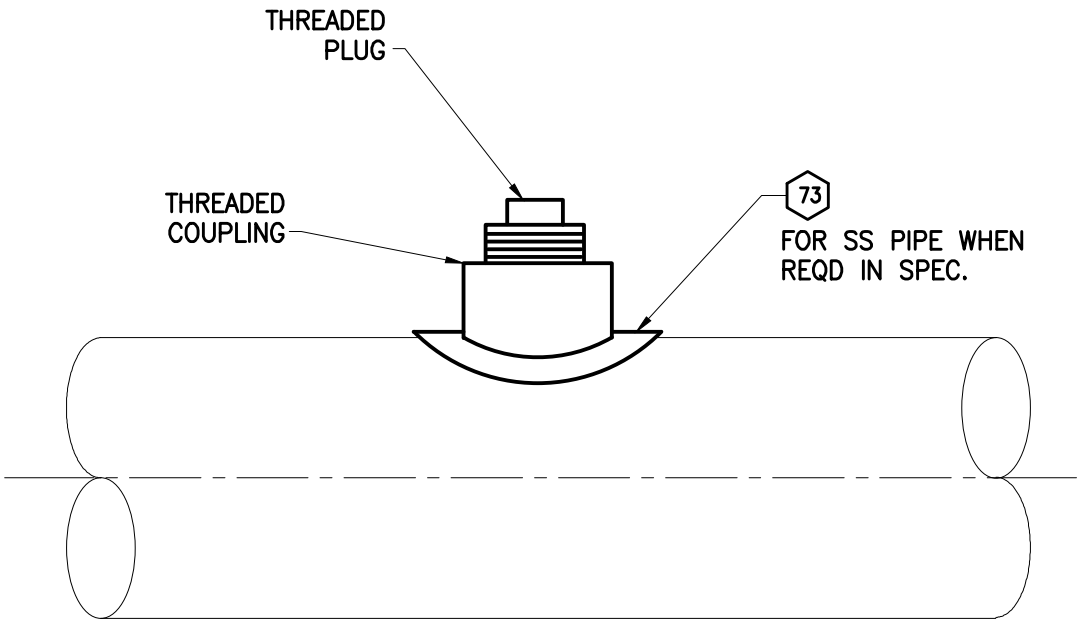
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:					PIPE DRAIN
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-103		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. SIZE AND LOCATION (TOP, SIDE, OR BOTTOM) AS SHOWN ON PIPING DRAWING.

104

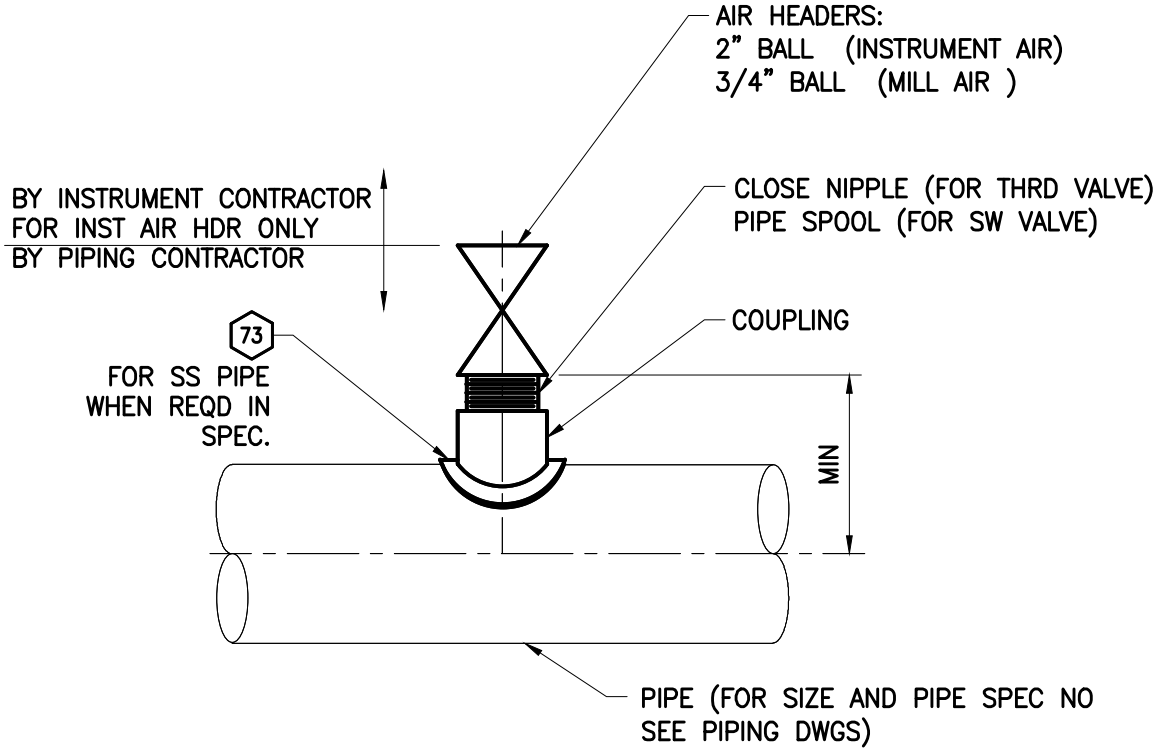
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	FLUSH OR DRAIN CONNECTION				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-104		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES, AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. FOR AIR BLEED BLOWDOWN, LOCATE AT PIPING HIGH POINT.
3. INSTRUMENT AND MILL AIR HEADERS:
   CONNECTIONS TO BE LOCATED AT 20 FT INTERVALS _____ OF COLUMN LINE __.
   CONNECTIONS TO BE LOCATED AT 40 FT INTERVALS _____ OF COLUMN LINE __.

106

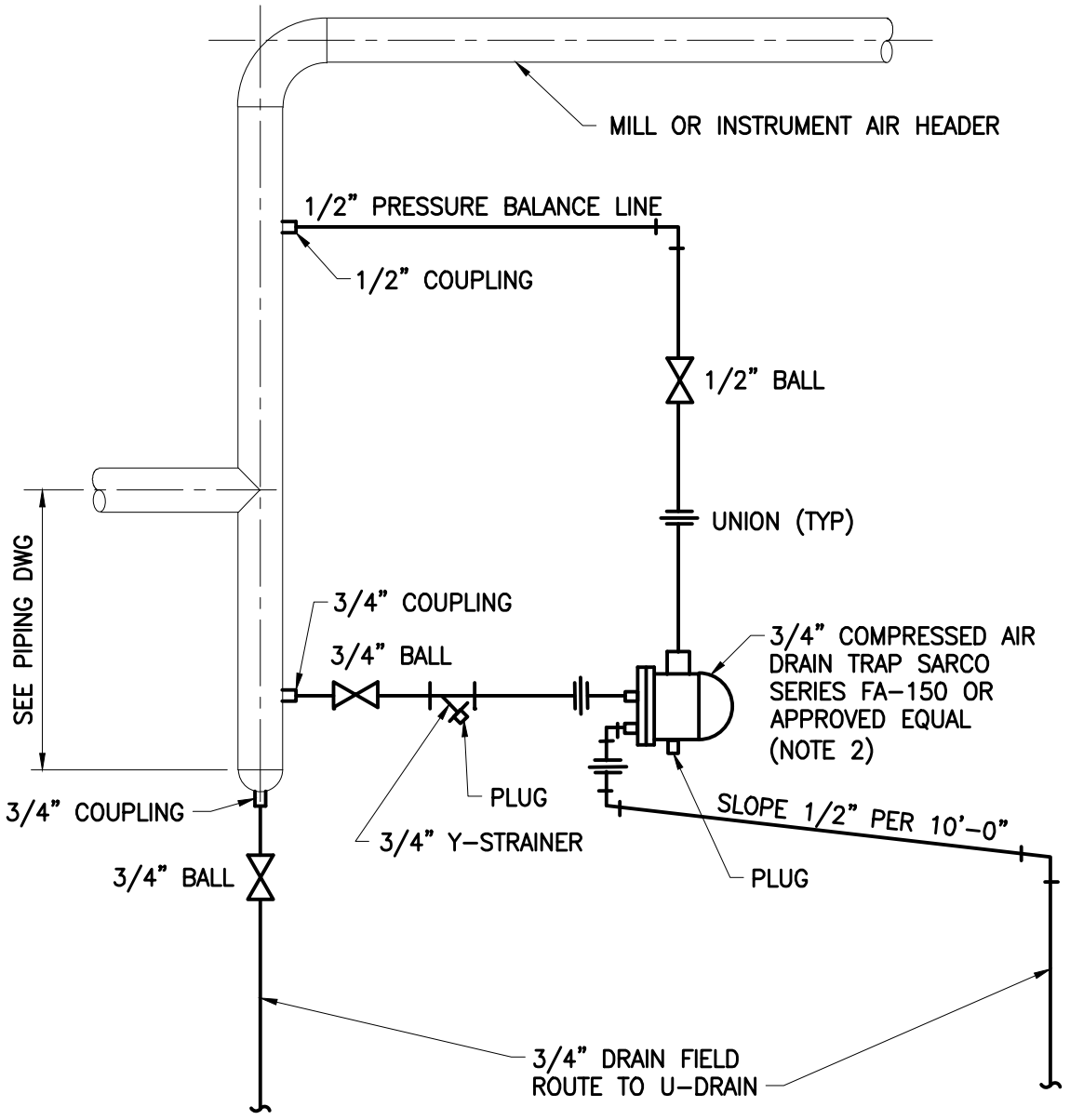
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	ALL PURPOSE CONNECTION 2" AND SMALLER				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-106		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE, VALVES, AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. PROVIDE SUPPORT FOR DRAIN TRAP.

111

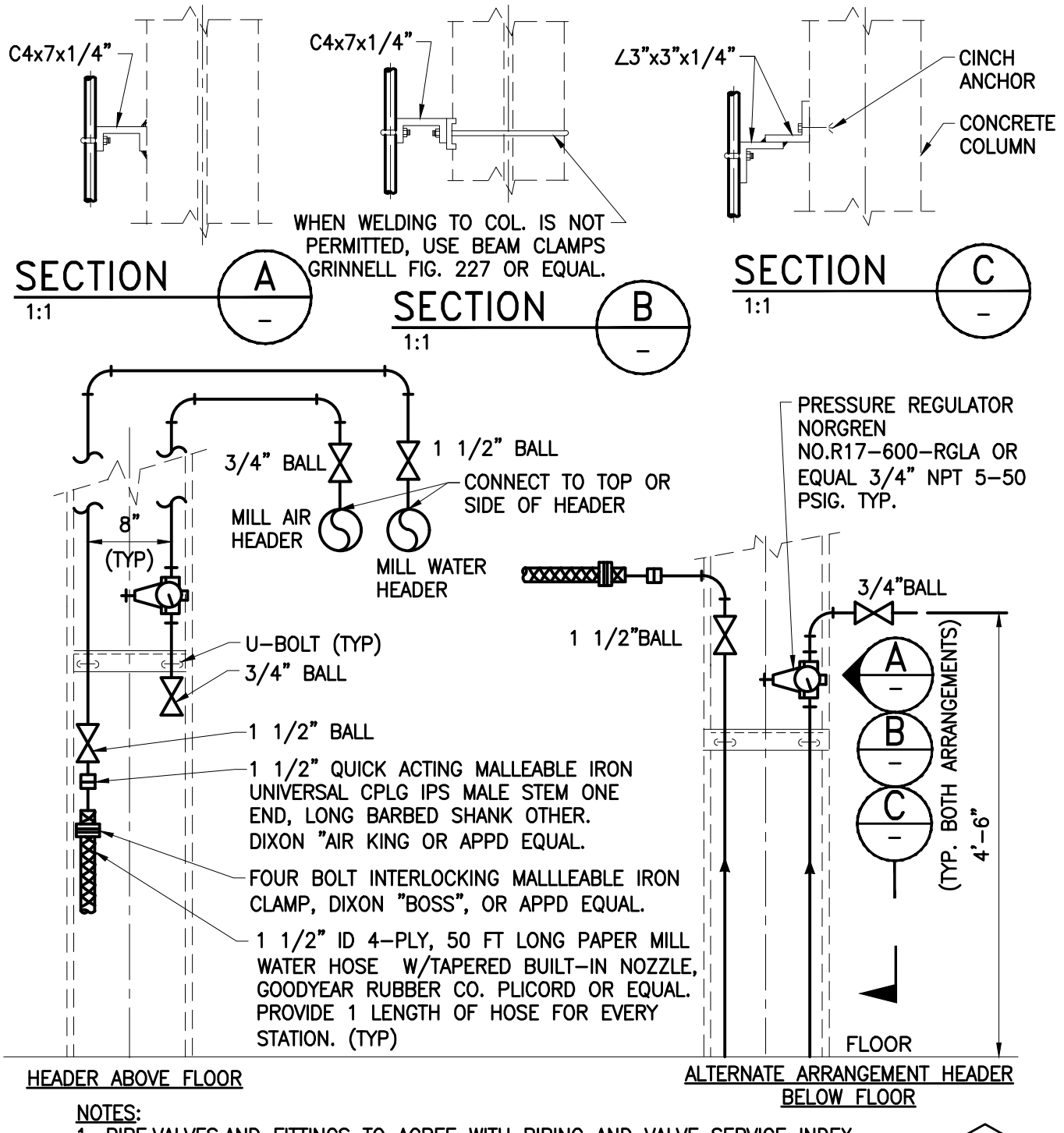
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	LOW POINT AIR DRAIN CONNECTION				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-111		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



NOTES:
1. PIPE,VALVES,AND FITTINGS TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. U.S.A. PROJECTS ONLY: MILL AIR HOSE STATIONS REQUIRE PRESSURE REGULATORS ACCORDING TO OSHA STANDARD SUB-PART P, CHAPTER XVII PART 1910. 242.

112

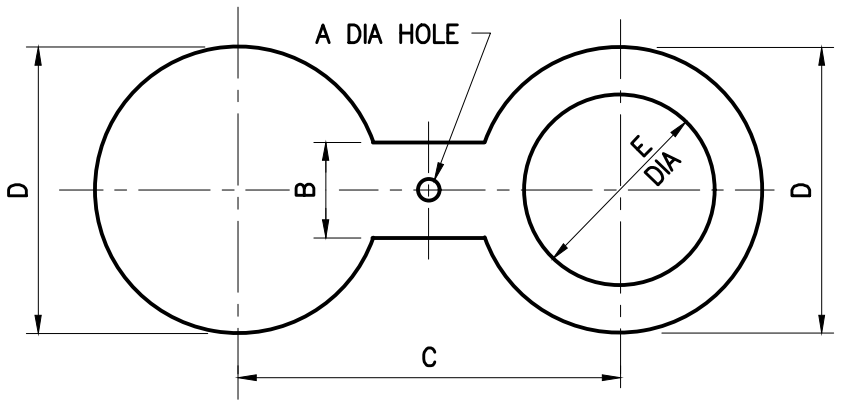
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	AIR AND WATER UTILITY STATION				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-112		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



DIMENSIONS FOR CLASS 150 FLANGES						
NPS	A	B	C	D	E	THK
3	0.75	2.50	6.00	5.25	3.50	0.25
4	0.75	2.50	7.50	6.75	4.50	0.38
6	0.88	3.00	9.50	8.62	6.62	0.50
8	0,88	3.00	11.75	10.88	8.62	0.50
10	1.00	4.00	14.25	13.25	10.75	0.62
12	1.00	4.00	17.00	16.00	12.75	0.75
14	1.12	4.25	18.75	17.62	14.00	0.75
16	1.12	4.25	21.25	20.12	16.00	0.88
18	1.25	4.50	22.75	21.50	18.00	1.00
20	1.25	4.75	25.00	23.75	20.00	1.12
24	1.38	5.50	29.50	28.12	24.00	1.25
26	1.38	4.25	31.75	30.38	26.00	1.38
30	1.38	4.25	36.00	34.63	30.00	1.62
36	1.63	4.50	42.75	41.12	36.00	1.88

NOTE 3

NOTES:
1. MATERIAL OF CONSTRUCTION TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. DIMENSIONS IN ACCORDANCE WITH ASME B16.48.
3. DIMENSIONS FOR 26, 30 AND 36 ARE PER ASME B16.47 SERIES A (MSS-SP44) FLANGES. DIMENSIONS WILL VARY FOR SERIES B (API 605) FLANGES. SEE SPECIFIC VENDOR CATALOG.

121

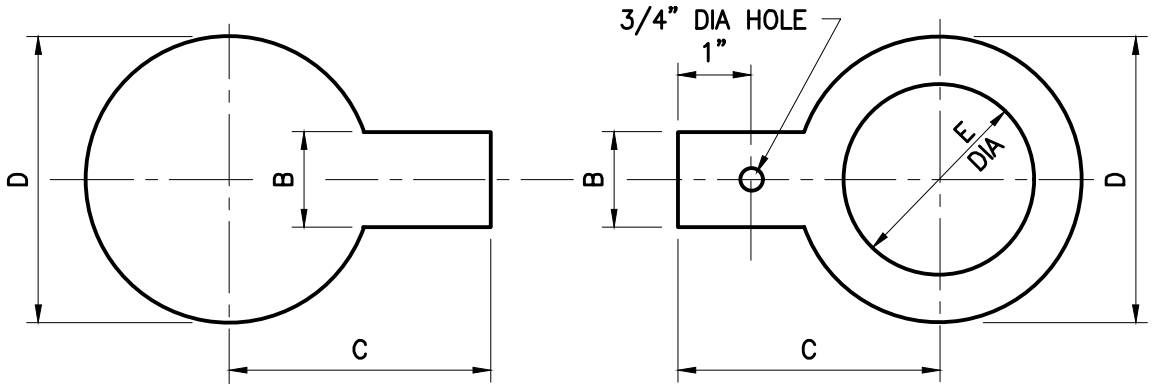
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	SPECTACLE BLIND, CLASS 150				
DATE:	15MAY20 (DDMMMYY)	DOCUMENTPIPING DLT OWNER:	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-121		REV: 0

ANSI A-8.5x11

STANDARD DETAIL

wood.



PADDLE BLIND

RING SPACER

DIMENSIONS FOR CLASS 150 PADDLE BLIND AND RING SPACER					
NPS	B	C	D	E	THK
3	1.00	6.25	5.25	3.50	0.25
4	1.50	7.00	6.75	4.50	0.38
6	1.50	8.00	8.62	6.62	0.50
8	1.50	9.25	10.88	8.62	0.50
10	1.50	10.50	13.25	10.75	0.62
12	1.50	12.00	16.00	12.75	0.75
14	1.50	13.00	17.62	14.00	0.75
16	1.50	14.25	20.12	16.00	0.88
18	1.50	15.00	21.50	18.00	1.00
20	1.50	16.25	23.75	20.00	1.12
24	1.50	18.50	28.12	24.00	1.25
26	1.50	19.62	30.38	26.00	1.38
30	1.50	21.88	34.63	30.00	1.62
36	1.50	25.50	41.12	36.00	1.88

NOTE 3

NOTES:
1. MATERIAL OF CONSTRUCTION TO AGREE WITH PIPING AND VALVE SERVICE INDEX.
2. DIMENSIONS IN ACCORDANCE WITH ASME B16.48.
3. DIMENSIONS FOR 26, 30 AND 36 ARE PER ANSI B16.47 SERIES A (MSS–SP4) FLANGES. DIMENSIONS WILL VARY FOR SERIES B (API 605) FLANGES. SEE SPECIFIC VENDOR CATALOG.

122

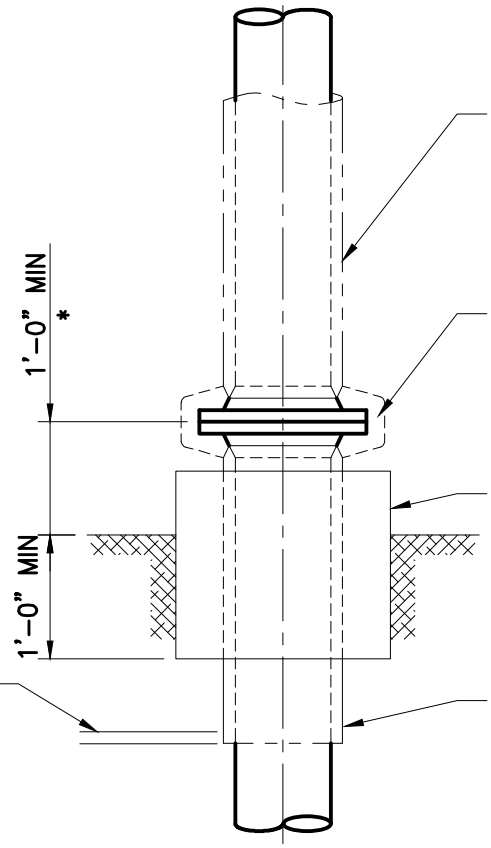
METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	PADDLE BLIND AND RING SPACER, CLASS 150				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–030–122		REV: 0

ANSI A–8.5x11

STANDARD DETAIL

wood.



SEE P&IDS AND PIPE SPECIFICATION FOR ABOVE GROUND PIPE INSULATION AND HEAT TRACING REQUIREMENTS

DIELECTRIC COUPLING OR FLANGE ISOLATION KIT SHALL BE INSTALLED WHERE REQUIRED FOR ELECTRIC ISOLATION

FOR NON METALLIC PIPE, UNDERGROUND PIPING CONTRACTOR SHALL INSTALL A SCH 10S 304SS PIPE PROTECTION SLEEVE. SLEEVE ID SHALL BE GREATER THAN FLANGE OD

FROST LINE AS ESTABLISHED FOR THE SITE CONDITIONS IN THE CONTRACT DOCUMENTS

WHERE PIPE INSULATION IS REQUIRED ABOVE GROUND, PIPE INSULATION F30 SHALL BE INSTALLED BY ABOVE GROUND INSULATION CONTRACTOR FROM BELOW THE FROST LINE UP TO THE ABOVE GROUND INTERFACE.

NOTES:
1. * SEE DWG FOR ACTUAL DIMENSION

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METRIC DIMENSIONS ARE IN MM AND US CUSTOMARY DIMENSIONS ARE SHOWN IN [] BRACKETS UNLESS NOTED OTHERWISE

TITLE:	DIELECTRIC COUPLING OR FLANGE ISOLATION KIT FOR UNDERGROUND/ABOVEGROUND INTERFACE				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-030-127		REV: 0

ANSI A-8.5x11

Piping Specification

Title:	**General Insulation and Installation**		
Project Doc. No.:	**SS-031-001**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	15Apr21	Standard		CKF	TCS	

1. GENERAL INSTRUCTIONS

1.1. INSULATION IDENTIFICATION

1.1.1. *Insulation* is identified by a letter and number code. The letter code identifies the material type and the number code denotes the jacketing material. For example, B15 means calcium silicate insulation with stainless steel jacket, M15 means mineral wool insulation with stainless steel jacket and F15 means cellular glass insulation with stainless steel jacket.

1.1.2. *Insulation types and thickness* are shown on the Piping Insulation Material Specifications, piping and equipment drawings and pipeline list.

1.2. INSULATION AND JACKET SCOPE

1.2.1. *Methods* specified in the material specifications are intended as a guide only. A general description of installation has not been included in the material specifications. It is the intent of this specification to provide for an installed insulation system (or systems) which retains its physical and functional integrity throughout the full range of operating, climatic, atmospheric, and corrosive conditions to which the system will be subjected. It shall be the contractor's responsibility to combine all materials into a system which takes into account and provides for: vessel expansion and contractions; compatibility of materials; correct type, size and number of fastenings, supports and bands; and correct methods of application, tieing, joining and fastening the various materials specified.

2. CODES AND STANDARDS

All referenced standards, codes and specifications shall be the latest edition applicable 6 mos in advance of contract or as adopted by the state.

- ASME B&PV Code Section IX Welding and Brazing Qualifications
- ASME B&PV Code Section II Material Specifications
- ASME B&PV Code Section V Nondestructive Examination
- ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Sheet, Strip, Plate, and Flat Bar
- ASTM C165 Measuring Compressive Properties of Thermal Insulation
- ASTM C168 Standard Terminology Relating to Thermal Insulation
- ASTM C449 Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
- ASTM C450 Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging
- ASTM C461 Standard Test Methods for Mastics and Coatings Used With Thermal Insulation
- ASTM C533 Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation
- ASTM C534 Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- ASTM C547 Standard Specification for Mineral Fiber Pipe Insulation
- ASTM C552 Standard Specification for Cellular Glass Thermal Insulation

- ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- ASTM C585 Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing
- ASTM C592 Standard Specification for Mineral Fiber Blanket Thermal Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
- ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation
- ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
- ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
- ASTM C929 Standard Practice for Handling, Transporting, Shipping, Storage, Receiving, and Application of Thermal Insulation Materials for use in Contact with Austenitic Stainless Steel
- ASTM C1055 Standard Guide of Heated System Surface Conditions that Produce Contact Burn Injuries
- ASTM C1423 Standard Guide for Selecting Jacketing Materials for Thermal Insulation
- ASTM C1617 Standard Practice for Quantitative Accelerated Laboratory Evaluation of Extraction Solutions Containing Ions Leached from Thermal Insulation on Aqueous Corrosion of Metals
- ASTM C1639 Standard Specification for Fabrication of Cellular Glass Pipe and Tubing Insulation
- ASTM C1729 Standard Specification for Aluminum Jacketing for Insulation
- ASTM C1767 Standard Specification for Stainless Steel Jacketing for Insulation
- ASTM D579 Standard Specification for Greige Woven Glass Fabrics
- ASTM E84 Surface Burning Characteristics of Building Materials
- MICA - Midwest Insulation Contractors' Association National Commercial and Industrial Insulation Standards Manual
- UL 723 Standard Test for Surface Burning Characteristics of Building Materials

2.1. Local codes having jurisdiction over the use of any materials and their application are hereby made part of this specification and shall apply.

2.2. The Code of Federal Regulations, Title 29 - Labor, Part 1910, Occupational Safety and Health Standards requires that heated surfaces which can be contacted by personnel shall not exceed 140°F. All surfaces within 7 feet of the floor or working platform or within 15 inches measured horizontally from stairways, ramps or fixed ladders shall be covered with insulating material as specified, or guarded to prevent contact. Thickness shall be as specified in paragraph 1.1.2.

2.3. Definitions of terms used in this specification shall follow the recommendations of ASTM C168.

3. INSULATION USE CODE FOR PIPING

This code signifies special uses and applications of insulation. These are as follows:

H = *Heat Conservation.* Piping marked with the letter “H” in the insulation code indicates hot piping to be insulated for heat conservation. .

C = *Cold Conservation.* Piping marked with letter “C” in the insulation code is to be insulated for condensation prevention as well as temperature conservation. .

P = *Personnel Protection.* Piping marked with letter “P” after the insulation code is insulated for personnel protection only. As required by Occupational Safety and Health Standards surface temperature of any pipe or equipment within reach of personnel shall not exceed 140°F. All hot surfaces within 7 feet of the floor or working platform or within 15 inches measured horizontal from stairways, ramps, or fixed ladders shall be covered with insulating material. .

F = *Freeze Protection.* Piping marked with the letter “F” after the insulation code is insulated for freeze protection only. This insulation material is usually combined with line tracing.

FP = *Fire Protection*. Piping marked with letters “FP” in the insulation code is to be insulated with materials resistant to fire.

AC = *Acoustical insulation*. Piping marked with the letters “AC” in the insulation code indicates piping to be insulated with materials to retard noise.

AS = Condensation Prevention (*Anti-Sweat)*. Piping marked with the letters “AS” in the insulation code indicates piping to be insulated to avoid condensation due to temperature variances and humidity conditions.

4. TRACING CODE FOR PIPING

This code signifies special tracing or jacket requirements. These are as follows:

PHT = *Piping* marked with the letters “PHT” in the insulation code is partially traced with electric cable tracing.

TE = *Electric Tracing.* Piping marked with the letters “TE” after the insulation code is traced with electrical cable tracing. Traced lines shall be insulated as called for

5. GENERAL INSTALLATION

5.1. Application of insulation shall not begin prior to the conclusion of all leak testing and examination, unless authorized by the owner.

5.2. All insulation work shall be coordinated with the work of others. Cutting of existing material shall be kept to a minimum and shall be done only after approval for this has been obtained from the owner. For cutting and repair work use mechanics of the trade that originally executed the work and repair to match original construction. All costs for such work shall be paid for by this contractor.

5.3. The work site shall be kept clean and free of debris at all times. Contractor shall clean up materials spilled, tracked or spattered. Remove from the site all debris accumulated during the work and leave clean conditions satisfactory to the owner.

5.4. All materials used shall be Asbestos-free.

5.5. Install insulation, jacketing, corrosion barriers, vapor seals, adhesives and fastening systems in full accordance with manufacturer's installation instructions.

5.6. There shall be sufficient clearance between insulation surfaces and any obstruction such as stairs, platforms, railings, or other piping to allow for the insulation and normal operational movements.

5.7. All materials shall be qualified for use on austenitic stainless steel in accordance with ASTM A795 and handled, transported, and stored in accordance with ASTM C929.

5.8. Verify that materials received at site are as specified or approved. Check labels, material safety data sheets, thickness and ensure that they are undamaged and dated within the manufacturer's recommended shelf life.

5.9. Store all materials to ensure they are protected from mechanical damage, moisture, extreme heat or cold, and direct sunlight.

6. INSULATION INSTALLATION

6.1. Prefabrication and field fabrication of thermal insulation fitting covers for pipe, vessel lagging and dished heads shall follow the recommended practice of ASTM C450, except that par. 6.5 is hereby modified as follows: Preformed pipe insulation shall be used when specified, and flat block cut to proper curvature shall be used only when preformed pieces are not commercially available.

6.2. Other pipe fittings and accessories shall be insulated with insulation segments specifically cut or formed to fit the shape of the item. All insulation segments shall be installed tightly without any gaps. Each segment shall be held in place with adhesive, wire or bands.

6.3. Double layer insulation shall be used for insulation thickness greater than 3 inches and for temperatures 600°F and higher. 4 inch and larger for personnel protection.

6.4. When double layer insulation is installed, stagger all joints. The joints of the second layer shall be located over the middle of the first layer.

6.5. Use wire of tape on first layer and band second layer.

6.6. Full sections or pieces of insulation as received from the manufacturer shall be used to minimize the number of insulation joints.

6.7. Insulation shall stop 1 inch, plus the bolt length, short of uninsulated flange connections to permit removal of bolts without damage to the insulation when the flanges are broken.

6.8. On vertical pipelines 3 inch in diameter and larger, bolted, friction type insulation support rings shall be installed by the contractor where the unsupported vertical length exceeds 10 feet or Table1.

6.9. Insulation support rings shall project from the pipe wall ½ inch less than the total insulation thickness.

6.10. Each pipe insulation section shall be secured to the pipe by applying tie wire or steel bands at a minimum of 3 per section length, with the end bands approximately 4 inches from the butt joints.

6.11. Insulation shall extend 3 inches beyond pipe end caps to allow for an air gap to compensate for thermal expansion.

6.12. Cellular glass and polyisocyanurate foam insulation for NPS $\leq$ 12 may be held in place with fiber-reinforced, pressure sensitive tape, overlapping one half of the circumference.

6.13. If wire ties or spiral binding are to be used, they should only be considered on pipe sections with an outer surface diameter of 8 inches or less. In the wire tie case, at least three wires tie per section.

6.14. Insulation for pipe supports shall encompass the support for pipelines insulated for Heat Conservation, Personnel Protection and Freeze Protection with Heat Tracing. Insulation for pipelines Insulated for Condensation Prevention and Cold Conservation shall be sealed and supported on the outside of the insulation and jacket with bearing surfaces such as extra high-density insulation or insulation protection shields to prevent damage to the insulation.

6.15. Pipe insulation shall be oversized to accommodate heat tracing. Oversized insulation shall be installed such that the insulation is not loose on the piping.

6.16. Grooving or deforming of the insulation to accommodate heat tracing is prohibited.

6.17. Outside insulation installed on piping and equipment shall be protected from rain and moisture at all times until the waterproof finish can be applied. Insulation that becomes wet shall be removed and replaced with dry insulation.

6.18. Expansion joints shall be provided for rigid insulation materials on all horizontal and vertical piping in accordance with Table 1. Expansion joints are not required for personnel protection insulation or on fibrous insulation on horizontal piping or equipment.

6.19. Expansion joints shall be 1 inch wide and packed tightly with mineral fiber blanket insulation compressed a minimum of 50%.

TABLE 1

	EXPANSION JOINT SPACING (feet)	
OPERATING TEMPERATURE	HORIZONTAL	VERTICAL
200°F	60	12
300°F	30	12
400°F	15	12
500°F	12	12
700°F	9	9
900°F	6	6
1200°F	6	6

7. JACKET INSTALLATION

7.1. Jacketing is to be rolled or formed as necessary prior the application to conform to the insulation surface and eliminate sharp edges.

7.2. On vertical lines, apply from bottom up and shed to weather.

7.3. Install jacket sections with longitudinal and circumferential joints lapped 2 inches.

7.4. Circumferential joints on vertical piping shall have S-Clips to prevent the jacket sections from slipping. Clips shall be equally spaced with (2) for pipe size 6 inch and smaller and (4) for pipe larger than 6 inch.

7.5. Horizontal lines place longitudinal joint 30 degrees below pipe centerline and aligned with others.

7.6. Flashing or caulking compound shall be applied at all laps and all other possible sources of moisture penetration.

7.7. A flashing ring shall be installed at the bottom insulation support to prevent moisture from entering the insulation system.

7.8. Bands shall be machine stretched and clamped in place under tension. Banding seals and twisted wire ends shall be embedded in the insulation. Bands shall have a smooth finish with edges free from burrs.

7.9. When metal screws are used to secure metal jacketing, screws shall be spaced at a maximum of 3 inch centers.

7.10. Metal jacketing shall be secured with bands spaced at a minimum of 12 inch centers, with bands at all butt-joint overlaps.

7.11. Jacketing for insulation on electrical traced piping shall be secured with bands only. Avoid screws or rivets that can damage electrical tracing.

7.12. Unless otherwise specified, insulation surfaces that have not been finished with metal jacketing shall be weatherproofed with membrane-reinforced weather barrier mastic.

7.13. Membrane reinforced mastic shall extend 3 inches under the adjoining metal jacket.

END OF DOCUMENT

Piping Specification

Title:	**Insulation Specifications**	
Project Doc. No.:	**SS-031-000**	Revision No.:

PIPING INSULATION MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	15Apr21	**CORPORATE STANDARD**		PROJECT NO:		**MATERIAL IDENTIFICATION:**	**M15**
APPROVED	TCS	DATE:	15Apr21						
REVISED:		DATE:		DESIGN CONDITIONS Ambient Temp: 65°F Wind Speed: 7.5 MPH Emissivity: 0.3	See Table for Temperature/ Thickness Chart			SPECIFICATION NUMBER:	**SS-031-000** REV **0**
ISSUED:		DATE:							

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM	*MFG. METHOD*	THICKNESS/ SIZE/PROPERTIES	DIMENSIONAL TOLERANCE ASTM	NOTES
Insulation, Pipe	All	Mineral Wool Pre-formed Shapes	C547 Type II, Grade A, C795	Pre-molded, Thermoset Resin Binder	Density 8 lb/ft^3 k =.45 @ 400°F	C335, C585, E84	3,4,5,11
	All	Mineral Wool Board	C612 Type IV, Grade A, C795	Board, Thermoset Resin Binder	Density 8 lb/ft^3 k =.45 @ 400°F	C335, E84	3,4,5,11
Insulation, Fitting	All	Mineral Wool Pre-formed Shapes or Board	C612 Type IV, Grade A, C795	Pre-molded or Fabricated, Thermoset Resin Binder	Density 8 lb/ft^3 k =.45 @ 400°F	C335, C450, E84	3,4,5,11,12
Jacket, Pipe	½ - 20	Stainless Steel	A240 TP304/304L, C1767 Type I, Grade I, Class A	3/16" Corrugated	0.010"	C1767	10
	24 - 36	Stainless Steel	A240 TP304/304L, C1767 Type I, Grade I, Class A	3/16" Corrugated	0.016"	C1767	10
	> 36	Stainless Steel	A240 TP304/304L, C1767 Type I, Grade I, Class A	3/16" Corrugated	0.020"	C1767	10
Jacket, Fitting							
Elbow	½ - 18	Stainless Steel	A240 TP316/316L, C1767 Type I, Grade II, Class A	2-Piece or 4-Piece Pressed, Smooth	0.016"	C1767	10
Elbow	≥ 20	Stainless Steel	A240 TP316/316L, C1767 Type I, Grade II, Class A	8-Piece Gore Sections, Smooth	0.016"	C1767	10
Other Shapes	All	Stainless Steel	A240 TP316/316L, C1767 Type I, Grade II, Class A	Gore Sections, Smooth	0.016"	C1767	10,12
Hardware							
Bands	½ - 14	Stainless Steel	A666 TP304	Annealed Temper	½" Wide x 0.020"	A167	
Bands	≥ 16	Stainless Steel	A666 TP304	Annealed Temper	¾" Wide x 0.020"	A167	
Wing Seals	½ - 14	Stainless Steel	A666 TP304	Annealed Temper	½" Wide x 0.032"	A167	
Wing Seals	≥ 16	Stainless Steel	A666 TP304	Annealed Temper	¾" Wide x 0.032"	A167	
Screws	All	Stainless Steel	304 Stainless Steel	Self-Tapping, Type A, Slotted Hex Washer Head	No. 8 x ½" Long	ASME B18.6.3	
Wire	All	Stainless Steel	A580 TP304 SS	Soft Annealed	18 Gauge	A580	

PIPING INSULATION MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	15Apr21	**CORPORATE STANDARD**		PROJECT NO:		**MATERIAL IDENTIFICATION:**	**M15**	
APPROVED	TCS	DATE:	15Apr21							
REVISED:		DATE:		DESIGN CONDITIONS Ambient Temp: 65°F Wind Speed: 7.5 MPH Emissivity: 0.3	See Table for Temperature/ Thickness Chart			SPECIFICATION NUMBER:	**SS-031-000**	REV **0**
ISSUED:		DATE:								

ITEM	SIZE RANGE (NPS)	IDENTIFICATION	MATERIAL ASTM	*MFG. METHOD*	THICKNESS/ SIZE/PROPERTIES	DIMENSIONAL TOLERANCE ASTM	NOTES
Expansion Springs	All	Stainless Steel	T304 Stainless Steel		4“ Long, Flat		
S-Clips	All	Stainless Steel	A666 TP304	Annealed Temper	¾” Wide x 0.030” (22 Ga Min)		
Support Rings	All	Stainless Steel	304 Stainless Steel		Clamp-on		
Rivets	All	Stainless Steel	304 (A2)	Dome Head	3/16” Diameter		
Reinforcing Membrane	All	Glass Mesh	10 x 10		10 x 10		
Sealant, Mastic and Adhesive							
Adhesive	All	High Strength, High Temperature, Contact Adhesive		Childers CP-82 Chil-Stix			3,6
Sealant	All	High Strength, High Temperature, Contact Adhesive		Childers CP-82 Chil-Stix			3,6
Mastic	All	Fire Resistant, Water-Based Mastic		Childers CP-10/11 Vi-Cryl			3,6

NOTES	REFERENCE SPECIFICATIONS
(1) For sizes smaller than NPS 1½, use insulation thickness for NPS 1½. (2) For sizes larger than NPS 18, use insulation thickness for NPS 18. (3) All materials shall be asbestos free and compatible with stainless steel in accordance with ASTM C795 (4) Insulation shall be installed in accordance with the manufacturer’s direction (5) Insulation shall be non-combustible and meet the Fire Hazard requirements of ASTM E84 with Flame Spread/Smoke Developed (6) All Adhesives, Mastics, Sealants and Vapor Stops shall be compatible with the Insulation Product to which they are applied. (10) All jacketing shall be furnished with integral, continuously heat-sealed Polysurlyn moisture barrier (11) Use double layer insulation for thickness shown below solid line (12) Removable covers for valves, fittings and flanges shall be manufactured using segments of block, preformed pipe shapes or molded components using the same materials and thickness as the adjoining pipe	SS-031-001

PIPING INSULATION MATERIAL SPECIFICATION

CHECKED:	CKF	DATE:	15Apr21	**CORPORATE STANDARD**		PROJECT NO:		**MATERIAL IDENTIFICATION:**	**M15**
APPROVED	TCS	DATE:	15Apr21						
REVISED:		DATE:		DESIGN CONDITIONS Ambient Temp: 65°F Wind Speed: 7.5 MPH Emissivity: 0.3	See Table for Temperature/ Thickness Chart			SPECIFICATION NUMBER:	**SS-031-000** REV **0**
ISSUED:		DATE:							

INSULATION THICKNESS TABLE for HEAT CONSERVATION (Thickness in Inches) (Notes 1 & 2)

FLUID TEMPERATURE	NOMINAL PIPE SIZE										
DEGREES F	**1½**	**2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**
200	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½
300	1½	1½	1½	1½	1½	1½	1½	1½	1½	2	2
400	1½	1½	1½	2	2	2	2	2	2	2½	2½
500	2	2	2	2	2½	2½	2½	3	3	3	3
600	2	2½	2½	2½	3	3	3	3½	3½	4	4
700	2	2½	2½	3	3½	3½	4	4½	4½	4½	4½
800	2	3	3½	3½	4	4½	4½	4½	5	5	5
900	3	3	3½	4	4½	4½	5	5	5	5	5
1000	3	3	3½	4	4½	4½	5	5	5	5	5

Piping Specification

Title:	**Pipe Support Presentation**		
Project Doc. No.:	**ES-039-001**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	
0	07Dec18	Standard		CKF	TCS	

1. PIPE SUPPORT PRESENTATION

1.1. SCOPE

Section 1 of this specification covers the Standard presentation of pipe supports. Section 2 covers pipe support presentation for 2D design projects. Section 3 covers pipe support presentation for 3D design projects. Special project requirements may dictate other methods of presentation suitable to the specific needs of the client , in which case the method of presentation will be adjusted to satisfy the client's needs.

1.1.1. *Engineered Systems.* All piping systems, which require stress and flexibility analysis (per ASME B31.1 or B31.3) are considered engineered systems and all pipe support considerations are determined as part of the system design. All piping 2½" diameter and larger with a design temperature of 250 degrees F and above for carbon steel piping and 200 degrees F and above for stainless piping require stress analysis.

1.1.2. *Rigid Support Systems* for pipe sizes NPS 2.5 inches and larger, which are designed on the basis of weight calculations at ambient or low (to 250°F) temperature only and do not require analysis per (ASME B31.1 or B31.3) shall be presented according to section 2 and/or section 3.

1.1.3. *Rigid Support Systems* for pipe sizes NPS 2 inches and smaller shall be selected by the contractor and they shall not be shown, unless they are part of a special engineered system. The contractor shall select the supports for these small bore pipes compatible with the supports used on the larger lines of same or equal service. The contractor shall detail, furnish and install all of the necessary components and other support elements required for these smaller lines.

1.2. DEFINITION

The broad terms "Hangers" or "Supports" are used for the entire range of the various methods of carrying the weight of pipe lines, insulation, the fluid carried and the compensation of movement in the piping system. "Hangers" are generally considered as those elements which carry the weight from above, with the supporting members being mainly in tension. "Supports" are defined as those which carry the weight from below, with the supporting members being mainly in compression. In many cases an assembly may be a combination of both of these. For the purpose of this standard both terms are used interchangeably.

2. 2D DESIGN PRESENTATION

2.1. 2D DESIGN (STANDARD PRACTICE — RIGID, VARIABLE AND CONSTANT SUPPORT SYSTEMS)

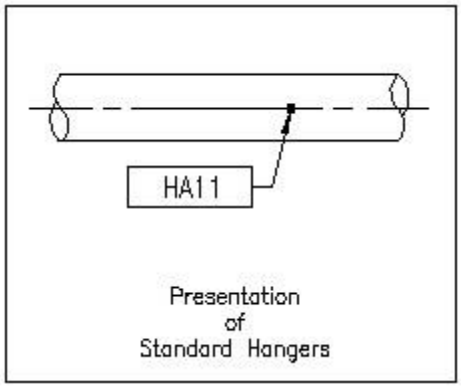
2.1.1. 2D Design presentation shall be the standard practice for pipe support presentation. Special non-standard supports may be included in this presentation, but their inclusion shall be held to a minimum.

2.1.2. *Location Drawings*. Piping general arrangements shall be used to show the hanger locations for the piping systems.

2.1.3. *Standard Hanger Assemblies*

2.1.3.1. Standard hanger assembly details shall be selected from those shown in the Hanger Assembly Standards (TD-039-HA01 thru TD-039-HZXX) provided as part of the project piping specifications.

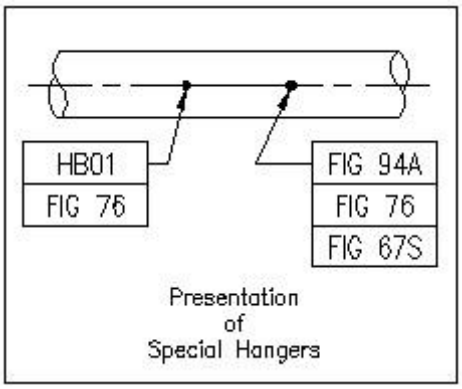
2.1.3.2. Standard hanger assembly code (per SS-039-003) and location point are marked on the piping general arrangement, as shown in EXAMPLE A :



EXAMPLE A

2.1.4. *Special (Non-Standard) Hanger Assemblies*

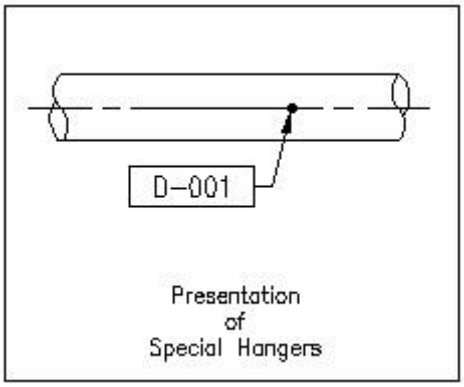
2.1.4.1. A combination of up to three individual Fig. Nos. may be selected from Standard components (TD-039-001) and combined to form a non-standard hanger assembly, provided the components fulfill the design requirements of the hanger assembly. In some cases a combination of a standard hanger assembly and a special hanger assembly may be used. Notes may be added to assist fabrication of the assembly. See EXAMPLE B:



EXAMPLE B

2.1.4.2. Special hanger assembly details shall be composed from the basic components shown in TD-039-001, as applicable. Each detail shall be assigned a detail number (example: D-001 or XXX-D-001 if the area number is required) and all shall be drawn using the same format as Standard Hanger Details. The details shall be assembled on a standard full size hanger assembly detail drawing or on individual 8½ in. x 11 in. drawings.

2.1.4.3. Special hanger assembly detail numbers and location points are marked on the piping general arrangements as shown in EXAMPLE C:



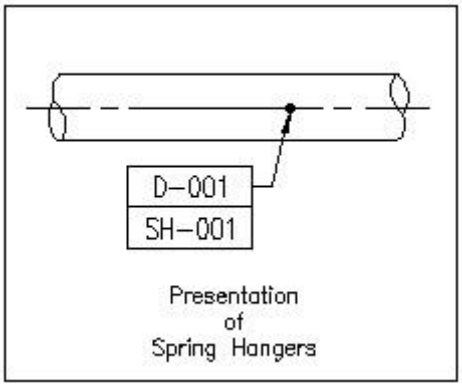
EXAMPLE C

2.1.5. *Variable and Constant Supports*

2.1.5.1. Each spring hanger shall be individually engineered and assigned a unique number. The spring hangers are numbered consecutively, beginning with SH-001. Each spring hanger number consists of the symbol “SH” and the sequential number. If area numbers are required for the project, the area number will be included in the spring hanger number. (Example: 530-SH-001). An individual spring hanger data sheet may be made for each spring hanger. See section 4.1 for an example of a spring hanger data sheet.

2.1.5.2. A Spring Hanger List shall be provided for each project, which lists the spring hanger number, pipeline designation, piping general arrangement and stress analysis problem and node numbers. See section 4.2 for an example of a spring hanger list. If the spring hanger list provides all of the required spring hanger data, the spring hanger data sheet may not be required.

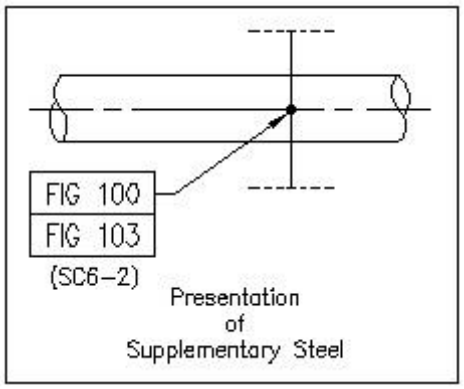
2.1.5.3. The standard hanger assembly and/or the special hanger assembly in combination with the spring hanger number and location point are marked on the piping general arrangement as shown in EXAMPLE D:



EXAMPLE D

2.2. SUPPLEMENTARY STEEL

Additional frame-in or support steel required for pipe support only, shall be indicated on the piping general arrangement as shown in EXAMPLE E. Sizing of steel shall be per SS-039-002, paragraph 2.3. The supplementary members shall be indicated by types as listed in TD-039-001, Fig. 103, or, if not present in TD-039-001, they shall be specifically noted on the drawings by size and shape. Supplementary steel used on special hanger assembly details shall be shown on the support detail and is not required to be shown on the piping general arrangement.



EXAMPLE E

3. **3D DESIGN PRESENTATION**

3.1. 3D DESIGN (STANDARD PRACTICE — RIGID, VARIABLE AND CONSTANT SUPPORT SYSTEMS)

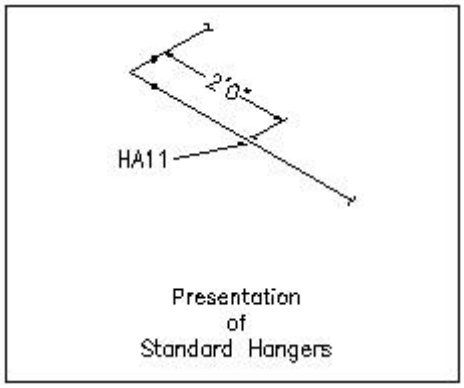
3.1.1. 3D Design presentation shall be the standard practice for pipeline support presentation where a 3D model is used on the project. Special non-standard supports may be included in this presentation, but their inclusion shall be held to a minimum.

3.1.2. Pipe support locations and identifiers shall be shown on the piping isometric for each pipe line.

3.1.3. *Standard Hanger Assemblies*

3.1.3.1. Standard hanger assembly details shall be selected from those shown in the Hanger Assembly Standards (TD-039-HA01 thru TD-039-HZXX) provided as part of the project piping specifications.

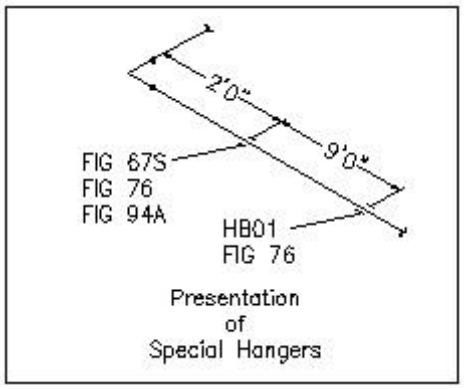
3.1.3.2. Standard hanger assembly code (per SS-039-003) and location point are shown on the piping isometric, as shown in EXAMPLE F :



EXAMPLE F

3.1.4. *Special (Non-Standard) Hanger Assemblies*

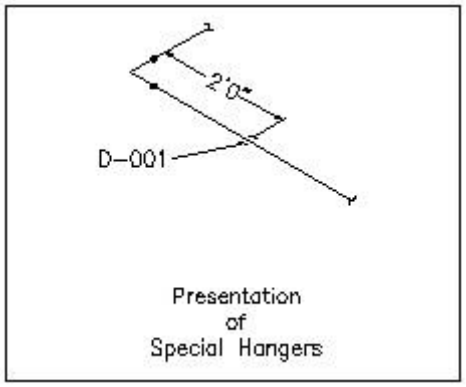
3.1.4.1. A combination of up to three individual Fig. Nos. may be selected from Standard components (TD-039-001) and combined to form a non-standard hanger assembly, provided the components fulfill the design requirements of the hanger assembly. In some cases a combination of a standard hanger assembly and a special hanger assembly may be used. Notes may be added to assist the fabrication of the assembly. See EXAMPLE G:



EXAMPLE G

3.1.4.2. Special hanger assembly details shall be composed from the basic components shown in TD-039-001, as applicable. Each detail shall be assigned a detail number (example: D-001 or XXX-D-001 if the area number is required) and all shall be drawn using the same format as Standard Hanger Details. The details shall be assembled on a standard full size hanger assembly detail drawing or on individual 8½ in. x 11 in. drawings.

3.1.4.3. Special hanger assembly detail numbers and location point are shown on the piping isometric as shown in EXAMPLE H:



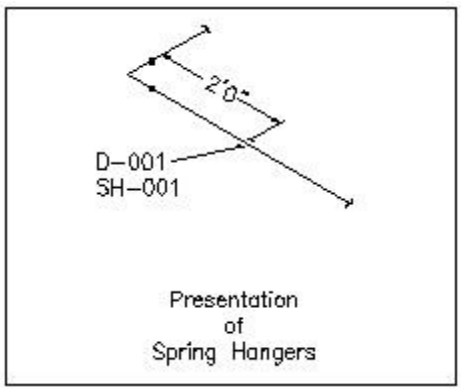
EXAMPLE H

3.1.5. *Variable and Constant Supports*

3.1.5.1. Each spring hanger shall be individually engineered and assigned a unique number. The spring hangers are numbered consecutively, beginning with SH-001. Each spring hanger number consists of the symbol “SH” and the sequential number. If area numbers are required for the project, the area number will be included in the spring hanger number. (Example: 530-SH-001). An individual spring hanger data sheet may be made for each spring hanger. See section 4.1 for an example of a spring hanger data sheet.

3.1.5.2. A Spring Hanger List shall be provided for each project, which lists the spring hanger number, pipeline designation and stress analysis problem and node numbers. See section 4.2 for an example of a spring hanger list. If the spring hanger list provides all of the required spring hanger data, the spring hanger data sheet may not be required.

3.1.5.3. The standard hanger assembly and/or the special hanger assembly in combination with the spring hanger number and location point are marked on the piping isometric as shown in EXAMPLE K:



EXAMPLE K

3.2. **SPECIAL DETAILED SUPPORT PRESENTATION**

3.2.1. *Special detailed support presentation* shall be an alternate for all engineered piping support presentations described in Paragraph 1.1.1 .,This method shall not be used for rigid support system, as described in Paragraph 1.1.2, unless it has been authorized by the Project Manger.

3.2.2. Piping general arrangements or Piping isometrics shall be used to show the hanger locations for the piping systems.

3.2.3. *Support Detail Drawings.* Each support assembly is assigned a support number and located on the piping general arrangement or piping isometric. In some cases the area number may be included in the support number. An individual 8½ x 11 detail assembly drawing shall be prepared for each support, each consisting of the detail, a parts list, and spring hanger data information if required. A Pipe Support List must be provided for each project.

END OF DOCUMENT

Piping Specification

Title:	**Pipe Support Scope of Work**		
Project Doc. No.:	**SS-039-001**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	Client
0	07Dec18	Standard		CKF	TCS	

Title:	**Pipe Support Scope of Work**		
Project Doc. No.:	**SS-039-001**	Revision No.:	**0**

1. **DESIGN BASIS AND SCOPE OF WORK**

1.1. ENGINEER'S WORK

Pipelines **TWO AND ONE-HALF INCHES AND LARGER**: The pipe hangers and supports will include all permanent piping systems for NPS pipeline sizes 2.5 inches and larger. Engineered piping systems may include some hangers for piping 2 inches and smaller. The engineer will designate type of support and indicate the location of all hangers and supports. The drawings shall be prepared by the engineer in accordance with ES-039-001 and will be provided to the contractor to show the extent of the work required.

1.2. CONTRACTOR'S WORK

Pipelines **TWO INCHES AND SMALLER**: The contractor shall select the supports for NPS pipeline sizes 2 inches and smaller in conformance with supports used on the larger lines of same or equal service in addition to providing all materials and labor to install the hangers and supports shown on the piping support drawings per paragraph 1.1, above. All rigid Support Systems for pipeline sizes NPS 2 inches and smaller shall be selected by the contractor unless they are part of a special engineered system, in which case they will be included in the piping the pipe hanger and support drawings. The contractor shall detail, furnish and install all of the necessary components and other support elements required for these smaller lines, including, but not limited to, all piping system hangers, supports, clamps, rods, turnbuckles, bracing, rolls, plates, brackets, saddles, restraints, anchors, braces, nuts, bolts, and other support elements for these smaller lines.

1.2.1. *Attachment Operations.* All welding, drilling, cutting or any other operations required for the attachment of a pipe to a support or hanger, or of a support or hanger to a supporting structure, shall be performed by the piping contractor. Welding attachments to pressure containing parts of ASME code-stamped pressure vessels is prohibited.

1.2.2. Auxiliary support members, such as angles, channels, beams, brackets and other items of structural steel, necessary for the sole support of pipe hangers shall be furnished by the piping contractor. All selected members shall be designed taking into account all of the loads and forces summarized in paragraph 3.

1.2.3. *Supports on Equipment.* When supporting piping systems from tanks or similar structures adequate reinforcement of the tank walls shall be provided so as to prevent concentrated loads on the tank walls. Attach hangers or supports to the reinforcing member, not directly to the tank wall.

2. **CODES AND STANDARDS**

2.1. CODES

The following codes, latest edition, shall govern and serve as a design basis:

- ASME B31.1. Code for Power Piping:
  - — Paragraph 120, Loads on Pipe Supporting Elements
  - — Paragraph 121, Design of Pipe Supporting Elements
- ASME B31.3, Code for Process Piping:
  - — Paragraph 321, Design of Pipe Supporting Elements

- AISC Code of Standard Practice and associated specifications.
- Any applicable local codes and regulations.

2.2. STANDARDS

Hanger components shall conform to the latest editions of the following standards as applicable:

- Manufacturers Standardization Society for the Valve and Fittings Industry
  - — MSS SP-58, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application and Installation
- American Institute of Steel Construction
- American Society for Testing and Materials
- American National Standards Institute
- American Welding Society

3. CRITERIA FOR SELECTION OF HANGERS AND SUPPORTS

Hanger and support types shall be selected to withstand all static and dynamic load conditions and shall take into consideration those limitations imposed by the surrounding structure, equipment, adjacent piping, ventilating and heating duct work and electrical trays. Consideration shall be given to the following conditions:

- Weight of pipe, valves, fittings, insulating materials, hanger components, and normal fluid contents;
- Weight of hydrostatic test fluid or cleaning fluid if normal operating fluid contents are lighter;
- Loads imposed during erection;
- Reaction forces due to operation of safety or relief valves;
- Wind, snow or ice loadings on outdoor piping;
- Additional loadings due to seismic forces according to seismic zone designated for area;
- The effects produced by thermal expansion of the piping system and difference in the loading values from hot to cold conditions;
- The possible reversal of orientation of forces and moments at anchors and guides in the case of cold springing the lines;
- Thrust forces in cases where expansion joints are used and at anchors at bend points;
- Excessive forces or moments caused by surges;
- Vibration induced by equipment or flow conditions.

4. INSTALLATION

Welding shall be performed in accordance with applicable paragraphs of SS-030-010 of the Piping Specifications and AWS. All pipe anchors, guides and auxiliary steel shall be of welded construction.

5. BASIC MATERIALS TEMPERATURE LIMITATIONS

Temperature limitations on materials with following limits:

Malleable Iron	450°F
Steel (ASTM A36, ASTM A575 and A576)	650°F
Alloy Steel (1¼% Cr-½% Mo)[1]	1050°F
Fiberglass[2]	250°F

1. Temperature limits on alloy steel clamps shall be in accordance with the limitations required by allowable design stresses as published in ASME B31.1.
2. The temperature limit is based on average conditions. For specific projects, the resin selection may allow an increase or force a decrease in maximum operating temperature.

6. DISSIMILAR MATERIALS

Where dissimilar materials make contact, such as between stainless steel piping and carbon steel wear surfaces, pipe saddles made of the same materials as the piping shall be installed.

END OF DOCUMENT

Piping Specification

Title:	**Pipe Support Specification**		
Project Doc. No.:	**SS-039-002**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	Client
0	07Dec18	Standard		CKF	TCS	

1. PIPELINE SUPPORT SPECIFICATION

1.1. GENERAL REFERENCES

1.1.1. *Methods of Presentation* are specified in **ES**-039-001.

1.1.2. *Design Basis and Scope of Work* are specified in **SS**-039-001.

2. SELECTION OF PIPELINE SUPPORT

2.1. STANDARD HANGER ASSEMBLIES

Standard hanger assemblies shall be selected from the *Assembly Data Sheets* (beginning with SS-039-HA01).

2.2. SPECIAL HANGER ASSEMBLIES

Special (Non-Standard) hanger assemblies are created, when none of the standard assembly details are suitable for a given requirement. The special assemblies shall be given “D” numbers, as D-001, D-002, and so on, as specified in ES-039-001.

2.3. SUPPLEMENTARY SUPPORTING STEEL

The standard hanger assembly details are shown with the assumption that the beam to which the beam clamp or beam attachment is fastened is a part of the building steel. Where the building structural members are off-set, supplementary support angles, beams, and brackets have been indicated. This additional frame-in steel for pipe support only shall be shown, located, sized, and identified by type on the drawings. See ES-039-001 for method of presentation. The steel shall be sized in accordance with Fig. 103, TD-039-001, and shall be able to support the full allowable rod load per SS-039-004 and paragraph 2.4, below. Material shall be in accordance with MSS SP-58, Table A2 and shall be hot-dip galvanized or coated to match existing steel.

2.4. HANGER RODS

Hanger rod sizes shall be designed and selected to carry the load as required in accordance with ASME B31.1. Consideration shall be given to the hanger spacings permitted in SS-039-004 and rod sizes specified for variable and constant spring supports

3. DESIGN REQUIREMENTS

3.1. ENGINEERED PIPING SUPPORT SYSTEMS

Engineered systems, as defined in ES-039-001, are fully detailed, and with all design requirements incorporated into the final presentation.

3.2. RIGID PIPELINE SUPPORT SYSTEMS

Rigid systems, as defined in ES-039-001 shall be designed in accordance with the design basis and general requirements described in SS-039-001 and as follows.

3.3. SPECIFIC REQUIREMENTS

3.3.1. *Spacing of Supports* for pipe heavier than standard weight (or Schedule 40 for NPS of less than 12.0 in.) shall not exceed that required by the latest edition of ASME B31.1. See SS-039-004 for spacing of supports when pipe is standard weight or less.

3.3.2. *Unusual loading*. Where unusual loading is evident or where concentrated loads are incorporated in the piping system, accurate weight balance calculations shall be made to

determine the required supporting force at each support location and the pipe weight load at each equipment connection.

3.3.3. *Combination Supports.* When piping design incorporates multiple horizontal pipelines with the bottom of all the pipelines (with or without shoes) at the same elevation, trapeze type supports shall be used. Where multiple pipelines are supported on a single supported member, consideration shall be given to the difference in expansion of the pipelines and possible resultant misalignment of support once the system is heated to its operating temperature. In this case it is desirable to arrange channels back to back spaced to accommodate a U-bolt for the largest size of pipe supported. If rods are used to support the assembly, the loads shall be calculated and rods sized with the same safety factor as other hanger rods. Welded beam attachments to attach combination type hangers to building steel may be used only if approved by the owner's representative. Otherwise, suitable beam clamps or other mechanical attachment devices shall be used.

3.3.4. *Unit Supports.* Where single horizontal pipelines are supported, a pipe attachment shall be selected that is best suited for the application, considering workability, function, strength and economics. This may be pipe clamp, clevis, U-bolt, double-rod roll, or other pipe attachment. The movement of the pipe from thermal expansion and other sources must be taken into consideration in this selection. The attachments between the pipe and the supporting structure (usually hanger rod) must be able to swivel at the ends to accommodate movement of the pipe. Provision must be made for vertical adjustment. Welded beam attachments to attach unit type supports to building steel may be used only if approved by the owner's representative. Otherwise, suitable beam clamps, or other mechanical attachment devices shall be used.

3.3.5. *Vertical Adjustment*. All rod type rigid hangers shall be provided with a means of vertical adjustment after installation.

3.3.6. *Shock Loads*. Where the piping system is subject to shock loads such as thrusts imposed by the actuation of safety valves, or seismic disturbances, hanger design shall include provision of shock absorbing devices similar to Anvil Fig. No. 200 to suppress the movement of the piping system.

3.3.7. *Riser Piping*. When practical, riser piping shall be supported independently of the connected horizontal piping. Pipe support attachments to riser piping shall be riser clamps with stop lugs, welded lugs or trunnions. Lugs or trunnions shall be of material compatible with that of the pipe and designed in accordance with governing ASME codes.

3.3.8. *Temperature*. Supports, guides and anchors shall be so designed that heat transmission to the building steel will be kept to an absolute minimum. The temperature of supporting parts shall be based on a temperature gradient of 100°F per inch distance from the outside surface of the pipe.

3.3.9. *Support Integrity*. Supports shall be designed so that they cannot become disengaged by movements of the supported pipe. Where it is possible for a nut or threaded device to turn off due to vibration, a lock nut shall be installed to prevent turning.

4. MOVING PIPELINES

Pipe hangers and supports shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping and prevent stresses greater than those considered in the design from being transferred onto the pipe or connected equipment.

4.1. HORIZONTAL MOVEMENTS

4.1.1. *Vertical hanger* rods shall be subject to tensile loadings only. At hanger locations where lateral or axial movement of the pipe is anticipated, suitable linkages, such as weldless eye nuts shall be provided to permit swing without bending of the rods. Where the hanger rod angularity from vertical is greater than 4 degrees from cold to hot positions of the pipe, the pipe hanger and structural attachments shall be offset in such a manner that the 4 degree angularity is not exceeded in either the cold or hot positions. Where the angularity requirement cannot be met, some form of roller or trolley shall be incorporated to accommodate the movement. For piping supported from below, an approved form of slide must be incorporated.

4.1.2. Unless special surfaces, such as teflon or graphite, are specified, the surfaces of steel pipe shoes and support steel used for sliding supports shall have all the paint, mill scale and rust removed. Then, both surfaces shall be cleaned with a degreaser and coated with molybdenum disulfide lubricant (Molylube).

4.2. VERTICAL MOVEMENTS

4.2.1. At points of support subject to vertical movement, spring hangers of suitable design to prevent excessive variation in supporting effect shall be used to provide for the movement. The deviation in supporting effect shall be limited to 6% for critical systems such as steam lines to and from turbine generators and mechanical drive steam turbines; steam and feedwater in the vicinity of the boiler terminal connections; and feedwater lines to and from the boiler feed pumps. On non-critical systems, the variation in supporting effect shall be limited to 25%. For all systems a greater allowance is permissible at supports where the variation in supporting effect is transferred to a rigid support or terminal connection specifically designed for the resulting load.

4.2.2. Constant support hangers shall be Anvill Fig. No. 80-V or Fig. No. 81-H or approved equal. The total travel of constant support hangers shall be equal to actual travel plus a minimum of 20% but in no case shall the difference between actual and total travel be less than one inch.

4.2.3. Variable support hangers shall be Anvil Fig. No. 82, Fig No. B-268 or Fig. 98, or approved equal.

4.2.4. Constant and variable support hangers shall have travel stops which will be factory installed so that the hanger level is preset in the “cold” position. All travel stops shall be removed before the piping system is put into operation, but not before hydrostatic testing and/or chemical cleaning is completed.

4.2.5. Constant and variable support hangers shall have distinct travel indicators and scales, hot and cold setting indicators and shall be stamped with design loads. After the piping system reaches operating temperature, all spring hangers shall be adjusted, if necessary, to the hot load position.

5. SPECIAL LOCATION AND CLEARANCE REQUIREMENTS

5.1. AT PUMPS

Where support is required, the suction piping (or discharge piping on double suction pumps) adjacent to pumps shall be supported with an *adjustable* stiffleg.

5.2. RISER GUIDES

Long pump discharge risers or other risers that may sway or vibrate from pulsations from pump or similar mechanical equipment, shall be guided. The guides or braces shall prevent movements in desired direction, but shall not limit or restrain movement of pipe due thermal expansion. On overflow lines, a brace or restraint shall be provided near the discharge.

5.3. RESTRICTIONS

Pipe support and hanger assemblies shall be used only for supporting pipelines. Electrical trays, instrument trays, cable or tubing shall be supported by separate assemblies unless written approval to the contrary has been requested and received from the owner's representative. Pipe hanger rods or supports shall not pass through electrical or instrument trays.

6. SUPPLEMENTARY DETAILS SHOWN ON DRAWINGS

The following special details are developed in the event that appropriate standard assemblies are not available:

- Details of special support assemblies not covered in this standard;
- Location and details (size, length, structural members, etc.) of special support assemblies;
- Spring type supports;
- Vibration control and sway braces;
- Special type of sliding, traveling or rolling supports on a particular pipeline;
- Anchors, restraints, and directional guides.

7. MATERIAL SPECIFICATION

7.1. MANUFACTURERS

Manufacturers named in the support and hanger standards and details are intended to establish a standard of quality only. Manufacturers of equal quality hangers will be considered upon submittal of proposed substitutions to the owner's representative for approval.

7.2. MATERIALS

The following materials are minimum specifications for carbon and alloy steel pipe. Materials used in conjunction with RTRP or stainless steel piping shall conform to those indicated for carbon steel when this material is used for construction or as noted on special or standard details when materials other than carbon steel are utilized.

- All support materials shall conform to MSS SP-58, Table A2, latest edition.
- Pipe clamps on lines 450°F or cooler shall be carbon steel and hot-dipped galvanized.
- Pipe clamps on lines 451°F to 750°F shall be plain carbon steel.
- Pipe clamps on lines 751°F to 1000°F shall be low alloy steel conforming to ASTM A387, Grade 22. Clamps shall be marked with the ASTM number for identification.
- A review shall be conducted to determine the appropriate material for pipe clamps on lines operating above 1000°F. Materials to consider are ASTM A387 Grade 22 or Grade 91 low alloy steel or ASTM A240 TP304, 316 or 321 stainless steels. Clamps shall be marked with the ASTM number for identification.

- Welding lugs shall be equal in quality to the pipe to which they will be welded and shall be painted the same colors as specified for clamps, above, according to operating temperature.
- All hanger material in contact with the pipe shall be as specified for clamps, above.
- Special temperature-limited construction materials such as fiberglass straps shall be limited to contact temperatures not exceeding those of the external pipe temperatures.

8. STRUCTURAL CONNECTIONS FOR PIPELINE SUPPORTS

8.1. LOCATIONS

Pipeline supports shall be located at the following places, as well as at intermediate points, so that the maximum support spacing listed in SS-039-004 of this standard is not exceeded.

- Bayline beams;
- Near or at changes in directions on horizontal or sloped lines;
- Both sides of flanged metering orifice joints on horizontal or sloped lines;
- On one side of welded valves 22 inches diameter and larger on horizontal or sloped lines;
- Near or at branch connections on horizontal or sloped lines;
- The underside of floor or platform steel on vertical cold lines that pass through the floor or platform.

8.2. COLD LINES

Hanger rods supporting cold pipe lines, or lines whose point of support does not move, may be bolted directly to angles, beams or supporting members.

8.3. HOT LINES

Hanger rods supporting hot lines, or lines that move at the point of support, shall not be bolted directly to angles, beams or supporting members. Provision shall be made that will allow the rod to assume a position of angularity without bending the rod. This can be accomplished through the use of swivel beam attachments or eye nuts.

8.4. CONCRETE BEAM ATTACHMENTS

Methods of attaching to concrete beams, concrete columns or concrete slabs shall be as shown in the standard hanger assemblies indicated on the drawings or, for special conditions, they shall be as detailed on the pipeline support design drawings. Anchor bolts cast in the concrete are preferred for making bolted on attachment connections. Where concrete is in place without anchor bolts, through bolts should be considered. Where it is not practical to use through bolts, expansion shield type anchors may be used, but only when the anchor is in shear under load. The support attaching to concrete or masonry shall be provided only with the approval of the owner’s representative.

8.5. PROHIBITED ATTACHMENTS

Pipelines shall not be attached to the following:

- Floor opening pipe sleeves
- Concrete block or masonry walls
- Gratings or floor plates
- Adjacent or overhead pipe

9. SPECIFIC REQUIREMENTS FOR THIN WALL STAINLESS STEEL PIPE

9.1. STANDARD HANGERS

Typical detail groups with standard hanger assembly codes HS, HT and HU (See SS-039-003) contain a group of standard hanger assemblies specifically designed for thin wall stainless steel pipe.

9.2. PIPE CLAMPS

Pipe clamps (TD-039-001, Fig. 60, 61) shall be used as first choice on suspended thin wall stainless steel pipe. Where carbon steel pipe clamps are used, *two 180* degree stainless steel saddles 12 inches long shall be used under the clamp. The saddles should be approximately the same thickness as the pipe and should be welded to the pipe using stainless steel electrodes as specified in SS-030-013 of the Piping Specification.

9.3. CLEVIS TYPE HANGERS

Clevis type hangers (TD-039-001, Fig. 66), may be used as an alternate choice for supporting suspended thin wall stainless steel pipe. Where clevis type hangers are used a single 150 degree stainless steel saddle 12 inches long shall be used on the bottom side of the pipe. The saddle shall be approximately the same thickness as the pipe and should be welded to the pipe using stainless steel electrodes as specified in SS-030-013.

9.4. SADDLES

Where stainless steel pipe is supported directly on structural members or is guided through a carbon steel assembly, stainless steel saddles (TD-039-001, Fig. 75) shall be provided to give added reinforcement to the pipe and to prevent galvanic corrosion and carbon pick-up in the pipe. The saddles shall be as specified for pipe clamps, above.

9.5. U-BOLTS

U-Bolts (TD-039-001, Fig. 67, 67S) *shall not be used* for load bearing on thin wall stainless steel pipe. U-bolts may be used as guides where the weight of the pipe is taken on other types of support, such as structural members on pipe bridges.

9.6. SLEEVES

Riser lugs (TD-039-001, Fig. 42, 43) , riser clamps (TD-039-001, Fig. 74), welded supports (TD-039-001, Fig. 104), restraints (as detailed), anchors, or guides (TD-039-001, Fig. 101) for thin wall stainless steel lines can be used where the pipeline has been reinforced with two 180 degree segments made from pipe equal in material, diameter and thickness, securely welded to the pipe. The length of the pipe sleeve (TD-039-001, Fig. 76) shall be made to suit conditions but shall be no less than one-half pipe diameters or 12 inches, whichever is longer.

10. SPECIFIC REQUIREMENTS FOR HYDRAULIC TUBING

10.1. SUPPORTS

Supports made specifically for hydraulic tubing, such as clips, clamps or straps shall be used wherever practical.

10.2. WELDING

Hydraulic tubing shall not be welded to the support.

10.3. SPACING

Spacing between supports for hydraulic tubing shall not be more than listed below:

Tubing Diameter	Maximum Support Spacing
0.125 to 0.500	3 feet
0.625 to 0.875	4 feet
1.000 to 1.250	5 feet
1.500 to 2.000	7 feet

11. SPECIFIC REQUIREMENTS FOR REINFORCED THERMOSETTING RESIN PIPE (RTRP) (FRP)

11.1. STANDARD HANGERS

Typical detail groups with standard hanger assembly codes HF, HG, HM, and HN (See SS-039-003) contain a group of standard hanger assemblies specifically designed for RTRP pipe.

11.2. PIPE CLAMPS

Pipe clamps (TD-039-001, Fig. 106A, 106B) shall be used on suspended RTRP lines, unless other wise shown on the drawings. When pipe clamps are used, a liner of ⅛" thick elastomer liner, Garlock Style 7986 or equal, shall be wrapped over the pipe. Two 180 degree thin wall stainless saddles shall be used under the clamp and over liner. The saddles shall be strapped to the pipe using stainless steel bands. The pipe clamp shall a standard or non-standard diameter as required to fit the saddle.

11.3. CLEVIS TYPE HANGERS

Clevis type hangers shall not be used on RTRP lines.

11.4. SADDLES

Where RTRP lines is supported directly on structural members or is guided through a steel assembly. A mineral felt liner and thin wall stainless steel saddle shall be provided to give added reinforcement to the pipe. The liner, saddles and strapping bands shall be as specified for pipe clamps.

11.5. U-BOLTS

U-bolts (TD-039-001, Fig. 119) shall not be used for load bearing for RTRP lines. U-bolts may be used as a guide where the weight of the pipe is taken on other types of supports, such as structural members on pipe bridges. The U-bolt shall not touch the RTRP lines wall. A liner, saddle and strapping bands as specified for pipe clamps shall be placed under the U-bolt.

11.6. EXPANSION JOINTS

Fiberglass piping is flexible enough so that in most systems expansion joints are not required. However, because of the very high coefficient of expansion, special consideration may be required for long runs, or unusual situations and details will be provided.

11.7. IN-LINE DEVICES

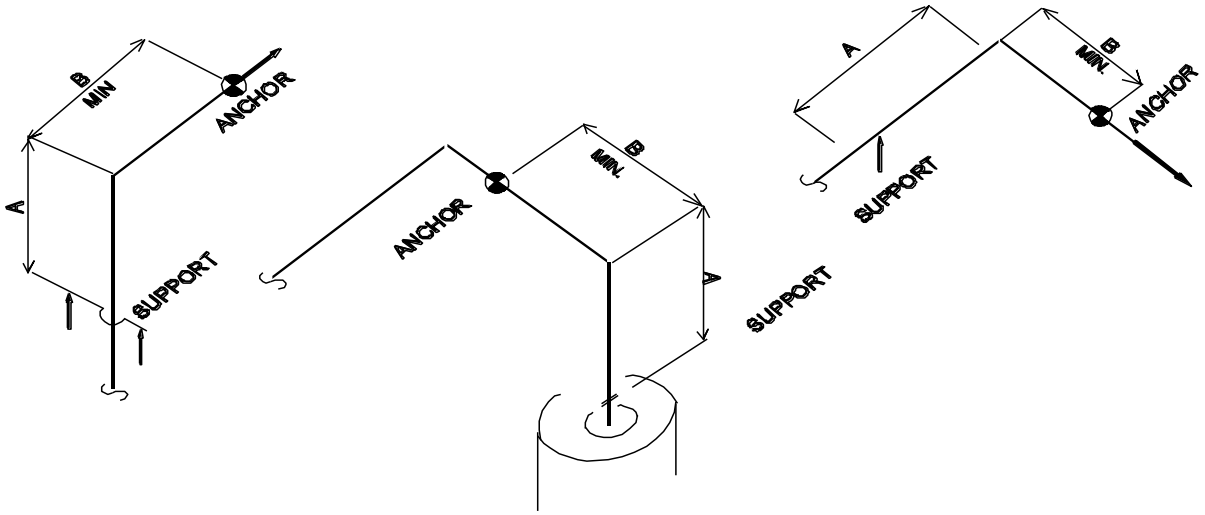
All in-line devices (TD-039-001, Fig. 112) should be supported independently of the pipe. This support could be from the flange or under the device but the load should not be transmitted through flange joints to the pipe for support. In addition to the supports (spacing per tables in Standards), fiberglass lines should be anchored near each end of the line and after every other bend using the table in Section 11.9 as a guide for location of anchors.

11.8. ANCHORS

The hanger system designed for RTRP pipe shall include the use of anchors after major bends such as pump discharges, long runs, after every bend in complex systems and before pipe terminations. The anchor location shall be determined by TABLE 1.

Table 1

NPS	F	NPS	F
2”	.78	12”	.79
3”	.78	14”	.85
4”	.78	16”	.91
6”	.78	18”	.96
8”	.78	20”	1.02
10”	.78	24”	1.14



A + B MEASURED IN FEET

$$B \geq F\sqrt{A}$$

12. SPECIFIC REQUIREMENTS FOR THERMOPLASTIC PIPE

12.1. LATERAL RESTRAINT (FIG. I)

The high coefficient of thermal expansion of plastic results in considerable expansion and contraction of the pipe runs with changes in temperature. Expansion shall be controlled by constraining the pipe using lateral restraint. At the same time these supports must allow free axial movement and must also adequately support the pipe.

12.2. HANGER SUPPORTS (FIG. II)

Hanger type supports do not provide lateral restraint to the pipe and encourages snaking so they shall not be used, except as stated in 12.3. below.

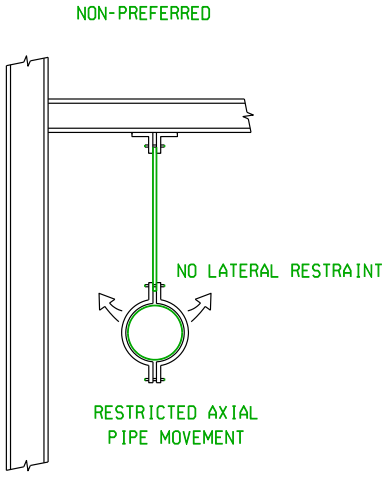


FIGURE II

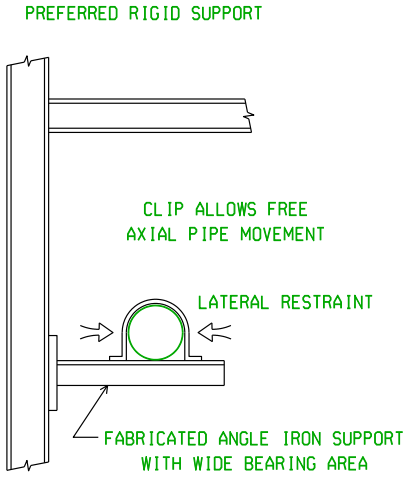


FIGURE I

12.3. EXCEPTIONS

In some cases it may be physically impossible or impractical to install the preferred rigid support, such as in between widely spaced columns. In this event hanger rods with loose fitting clips should be used and the rods should be kept as short and as few as possible.

12.4. SUPPORT SPACING

The maximum distance between supports (spacing in ft.) for pipes shall be as determined by the manufacture or the applicable Code for the specified material at the design temperature.

12.5. PIPE CLIPS

All pipe clips should permit free axial pipe movement at all temperatures and should give good bearing support to the pipe. Metal clips and supports should be free of sharp edges likely to damage the pipe.

12.6. SUPPORT OF VALVES

Heavy valves or meters shall be supported independently otherwise distortion of the system will occur. Valve support plates shall be used for this purpose. All steel brackets in contact with the plastic system should be free of sharp edges to avoid damage to the pipe.

END OF DOCUMENT

Piping Specification

Title:	**Support Assemblies and Identification Code**		
Project Doc. No.:	**SS-039-003**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	Client
0	07Dec18	Standard		CKF	TCS	

Title:	**Support Assemblies and Identification Code**	
Project Doc. No.:	**SS-039-003**	Revision No.: **0**

1. STANDARD HANGER ASSEMBLIES AND IDENTIFICATION CODE

A four-digit code identifies standard pipe hanger assemblies on the location drawings and in the specifications, as follows:

H A 0 1

H	**A**	**01**
Hanger	Assembly Code	Assembly Number

- The **first** digit is an H signifying the symbol for a *standard* hanger assembly.
- The **second** digit is an assembly code which indicates the pipe material supported and the basic support structure composition, as identified in the List of Assembly Codes
- The **third** component composed of the numbers 01-99 designates the standard hanger assembly (serial) number.

List of Assembly Codes	
Code	**Description of Basic Support Structure**
A	Carbon and Low Alloy steel pipe supported from structural steel
B	Carbon and Low Alloy steel pipe supported from stanchions
C	Carbon and Low Alloy steel pipe supported from structural concrete
F	Fiberglass pipe supported from structural steel
G	Fiberglass pipe supported from structural concrete
J	Fiberglass pipe supported from stanchions
S	Stainless steel pipe supported from structural steel
T	Stainless steel pipe supported from stanchions
U	Stainless steel pipe supported from structural concrete
V	Spring hangers supported from structural steel
W	Spring hangers supported from stanchions

1.1. PARTS LIST

1.2. The parts list shown on each individual Hanger Assembly Data Sheets (starting with TD-039-HA01) identifies and numbers individual component of the assembly in accordance with Hanger Component Standards TD-039-001.

END OF DOCUMENT

Piping Specification

Title:	**Pipe Support Spans**		
Project Doc. No.:	**SS-039-004**	Revision No.:	**0**

Project Name:	**Corporate Standard**	Project No.:	
Client:		Plant/Area No.:	

Rev	Date	Issued For	Prepared	Checked	Approved	Client
0	07Dec18	Standard		CKF	TCS	

Title:	**Pipe Support Spans**		
Project Doc. No.:	**SS-039-004**	Revision No.:	**0**

Pipe Line Support Spans

PIPE SIZE (NPS)	LIQUID (Std Wt)	AIR/STM (Std Wt)	SINGLE ROD (inches)	DOUBLE ROD (inches)	SINGLE ROD MAX LOAD	LIQ/AIR (Sch 10S)	LIQ/AIR RTRP	SINGLE ROD (inches)	SINGLE ROD MAX LOAD
1	7	9	⅜	⅜	730		6	⅜	730
1½	9	12	⅜	⅜	730		7	⅜	730
2	10	13	⅜	⅜	730		7	⅜	730
2½	11	14	½	⅜	1350	13	7	⅜	730
3	12	15	½	⅜	1350	14	8	⅜	730
4	14	17	⅝	½	2160	15	9	⅜	730
6	17	21	¾	⅝	3230	16	11	½	1350
8	19	24	¾	⅝	3230	18	12	½	1350
10	22	26	⅞	¾	4480	20	14	½	1350
12	23	30	⅞	¾	4480	21	15	⅝	2160
14	25	32	1	⅞	5900	22	16	¾	3230
16	27	35	1	⅞	5900	22	17	¾	3230
18	28	37	1	⅞	5900	22	18	⅞	4480
20	30	39	1¼	1	9500	24	19	1	5900
24	32	42	1½	1¼	13800	26	20	1¼	9500
30	33	44	1¾	1½	18600		21		
36	40	48	2¼	2	28000		22		

NOTES:

1. Support spans are measured in feet; loads in pounds.
2. When concentrated loads such as flanges, valves, and in-line equipment are present, the support span and rod size shall be determined on an individual basis.
3. The support span for RTRP (FRP) pipe is based on 150 psi pipe service. Use NBS voluntary product standard PS 15-69 Table 6 when pressure rating is less than 150 psi.
4. This table is not to be used for services over 650°F for Rods and 750°F for Std Wt Pipe Spans. Schedule 10S Pipe Spans are based on A312 TP316L Pipe @ 200°F. Temperatures above those indicated require component analysis and possible alternate materials.

END OF DOCUMENT

Piping Specification

Title:	**Typical Pipe Support Details**	
Project Doc. No.:	**TD-039-000**	Revision No.:

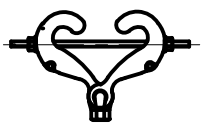
STANDARD DETAIL

wood.

FIG 1

DISCONTINUED

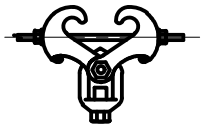
FIG 2



USE ON PIPE 24" DIA & SMALLER

FORGED STEEL BEAM CLAMP
ANVIL NO. 228 OR EQUAL

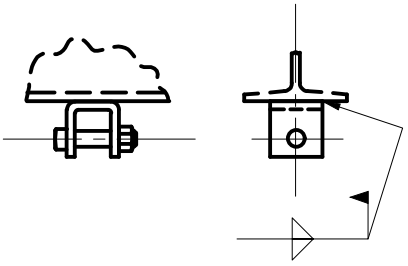
FIG 3



USE ON PIPE 24" DIA & SMALLER

FORGED STEEL BEAM CLAMP/WELDLESS EYE NUT
ANVIL NO. 292 WITHOUT LINKS OR EQUAL

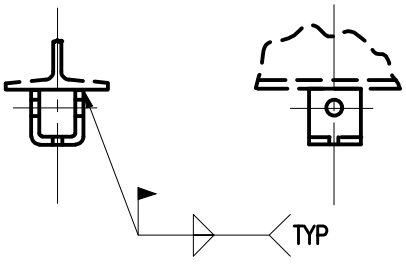
FIG 4



WITH BOLT AND NUT FOR 1" DIA ROD
AND SMALLER, WITH PIN & COTTER PINS
FOR 1 1/4" DIA ROD & LARGER.

WELDED BEAM ATTACHMENT
ANVIL NO. 66 OR EQUAL

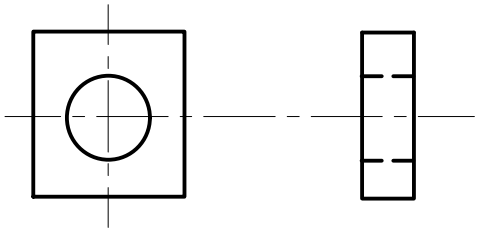
FIG 5



USE WITH ROD SIZE 1 1/4" DIA &
SMALLER

INVERTED WELDED BEAM ATTACHMENT
ANVIL NO. 66 OR EQUAL

FIG 6



STEEL PLATE WASHER
ANVIL NO. 60 OR EQUAL

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

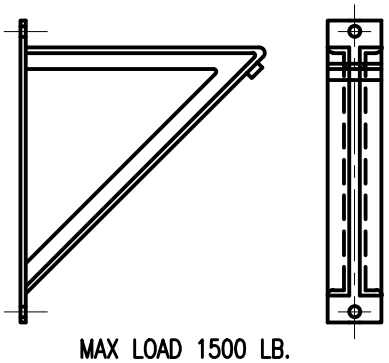
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

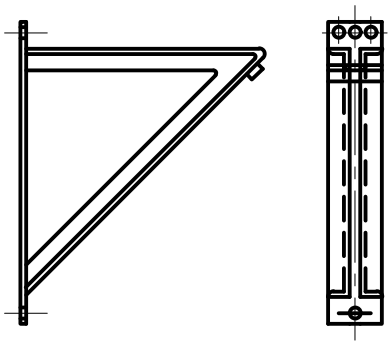
FIG 7



MAX LOAD 1500 LB.

MEDIUM WELDED STEEL BRACKET
ANVIL NO. 195 OR EQUAL

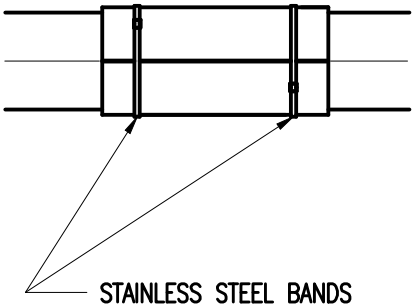
FIG 8



MAX LOAD 3000 LB.

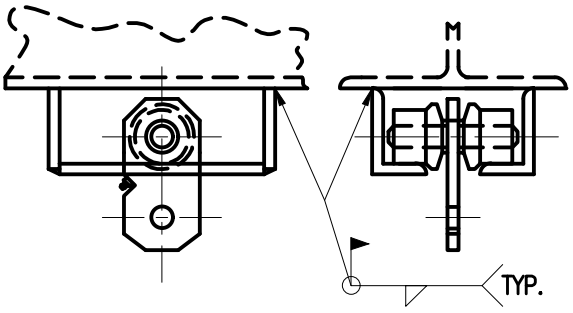
HEAVY WELDED STEEL BRACKET
ANVIL NO. 199 OR EQUAL

FIG 9



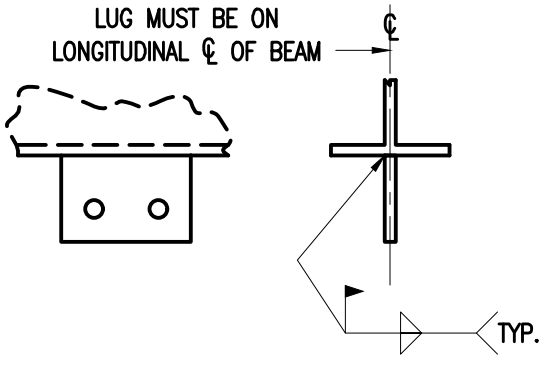
STAINLESS STEEL BANDS
ASTM A66 TYPE 316
1/2" W, .020" THK SOFT ANNEAL

FIG 10



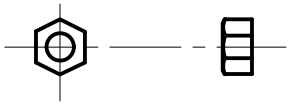
HORIZONTAL TRAVELER
ANVIL NO. 170 OR EQUAL

FIG 11



BEAM LUG
ANVIL NO. 54 OR EQUAL

FIG 12



CARBON STEEL NUT, HEAVY HEXAGONAL SERIES
TO ANSI B18.2.2 MATERIAL PER ASTM
ASTM A194 GR. 1 OR 2 ASTM A563 GR. B

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 2 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

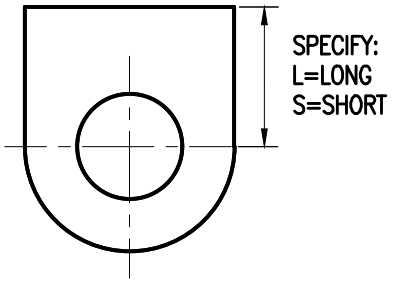
ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 13

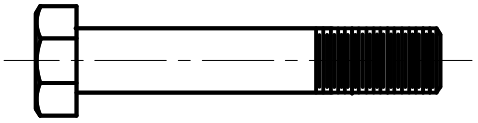
LUG MUST BE ON
LONGITUDINAL ℄ BEAM



WELDING LUG
ANVIL FIG. NO. 55 OR EQUAL

FIG 14

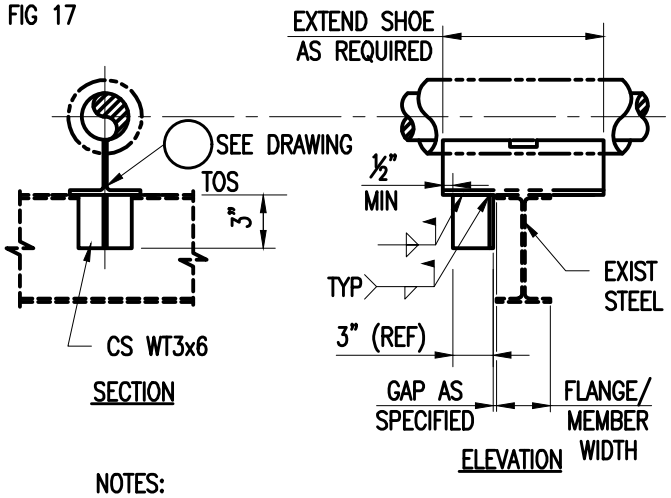
FIG 15



CARBON STEEL BOLTS HEAVY HEXAGONAL SERIES TO
ANSI/ASME B18.2.1 MATERIAL PER ASTM A 307-B

FIG 16

FIG 17



NOTES:
1. FOR MATERIALS SEE SS-039-002.

FIG 18

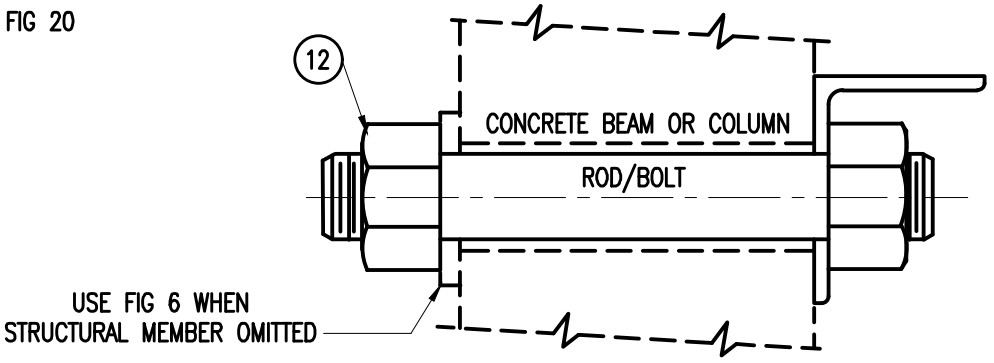
TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 3 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

FIG 19

FIG 20



BOLT SIZE	MIN HOLE SIZE	SINGLE BOLT LOADING MAX (LB)
3/4"	7/8"	10600
7/8"	1"	14400
1"	1 1/8"	18800
1 1/8"	1 1/4"	23900
1 1/4"	1 3/8"	29500
1 3/8"	1 1/2"	35600
1 1/2"	1 5/8"	42400

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 4 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

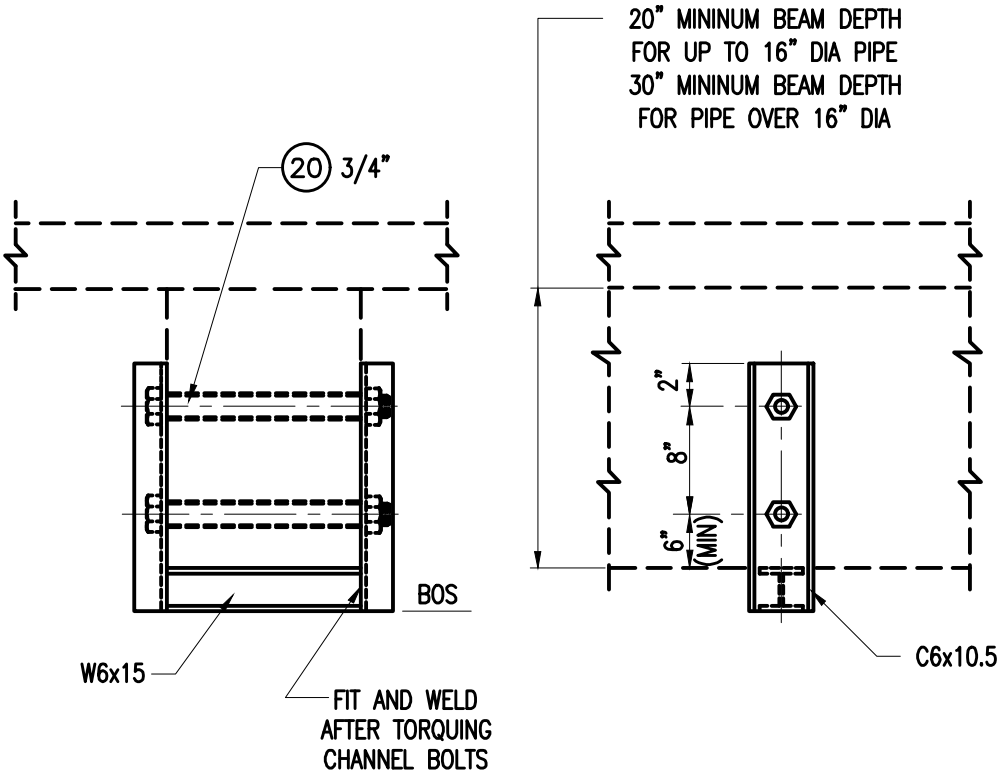
ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 21

HEAVY DUTY
CONCRETE BEAM
ATTACHMENT



NOTES:
1. SEE DRAWING FOR BOS.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 5 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A–8.5x11

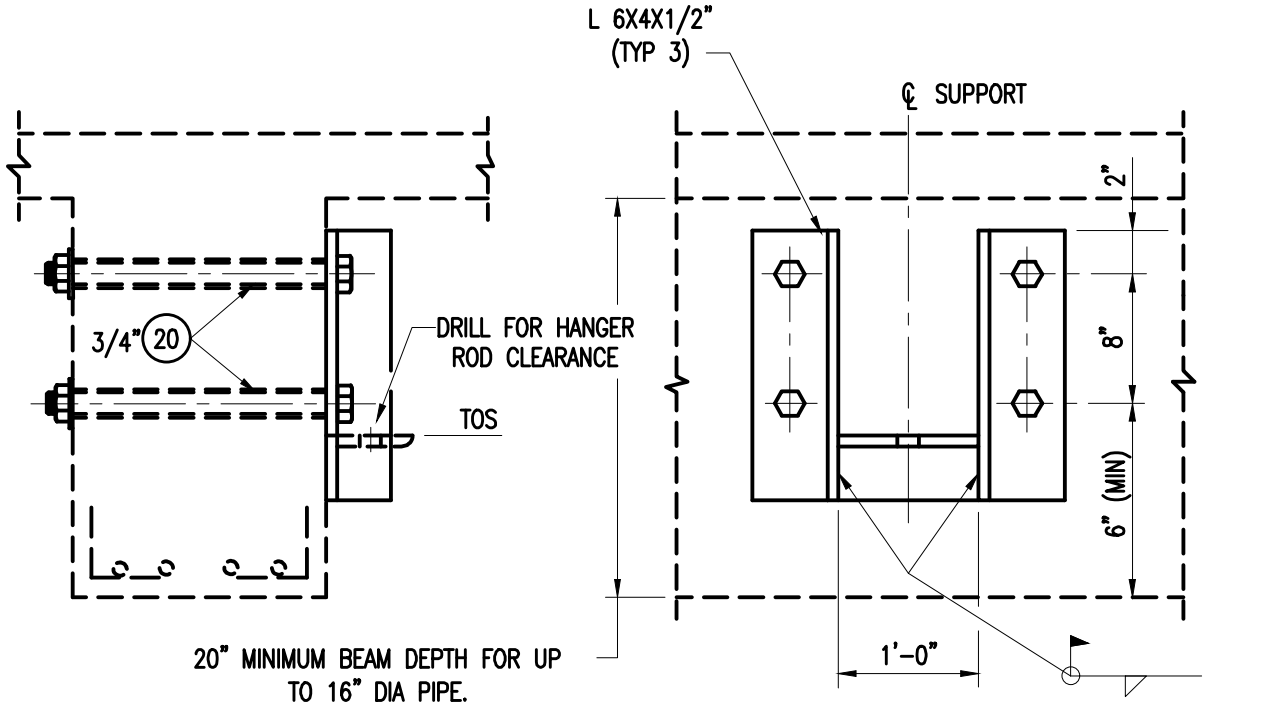
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 22



NOTES:
1. SEE DRAWING FOR TOS.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 6 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

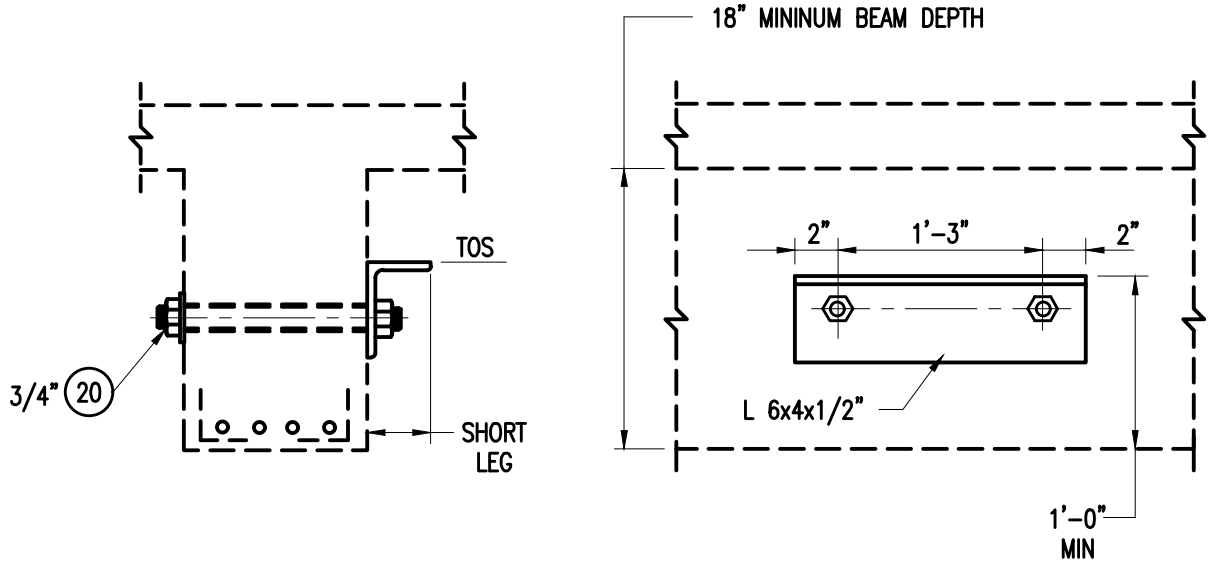
ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 23

MEDIUM DUTY
CONC BEAM
ATTACHMENT



NOTES:
1. SEE DRAWING FOR TOS.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 7 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 24

DISCONTINUED

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 8 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 25

BEAM SPAN ATTACHMENTS

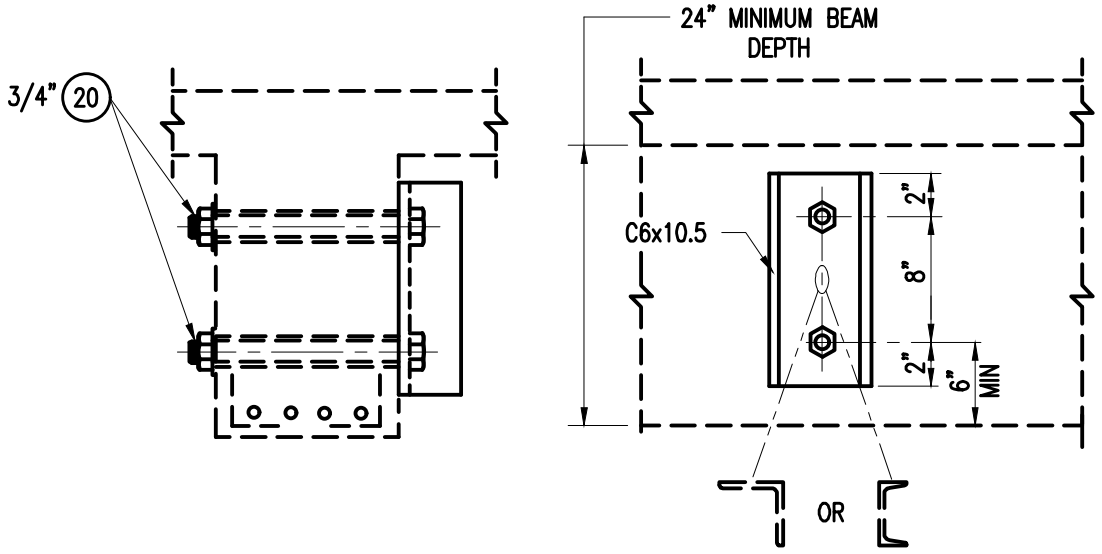
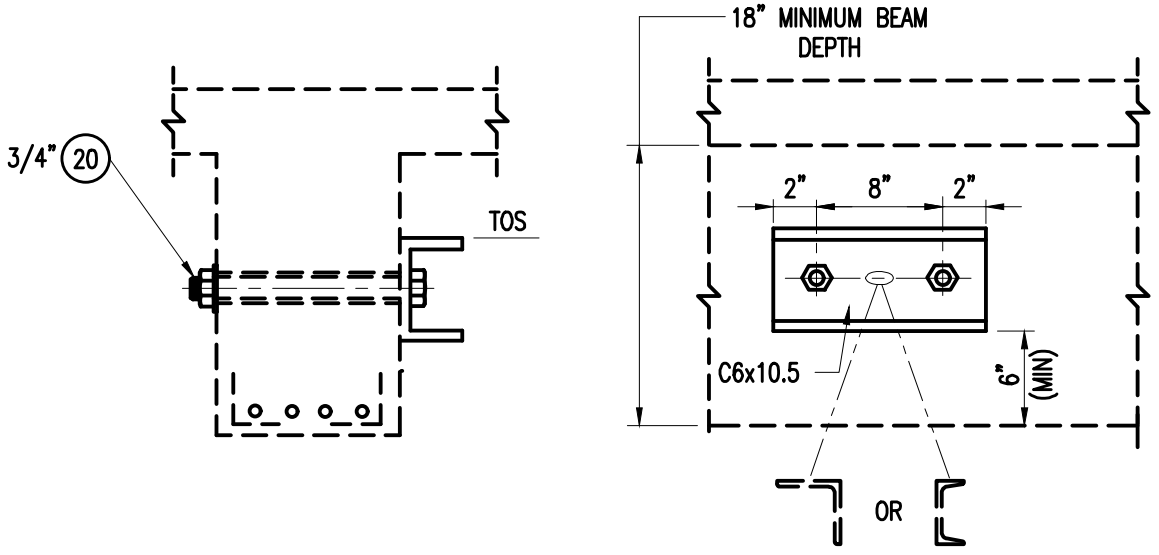


FIG 26

BEAM SPAN ATTACHMENTS



NOTES:
1. SEE DRAWING FOR TOS.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 9 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

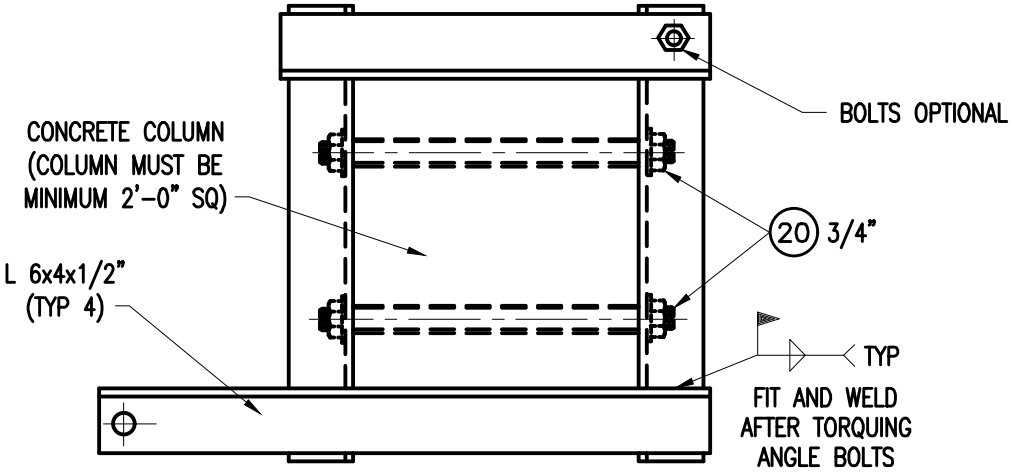
ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

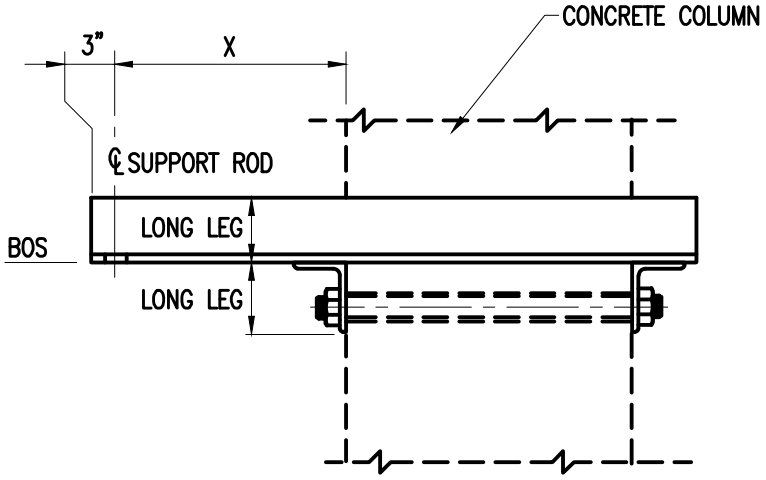
STANDARD DETAIL

wood.

FIG 28

MEDIUM DUTY
CONC COL
ATTACHMENT





NOTES:
1. SEE DRAWING FOR "X" AND BOS.
2. REVIEW DIMENSION "X" WITH STRUCTURAL DEPARTMENT.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 10 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

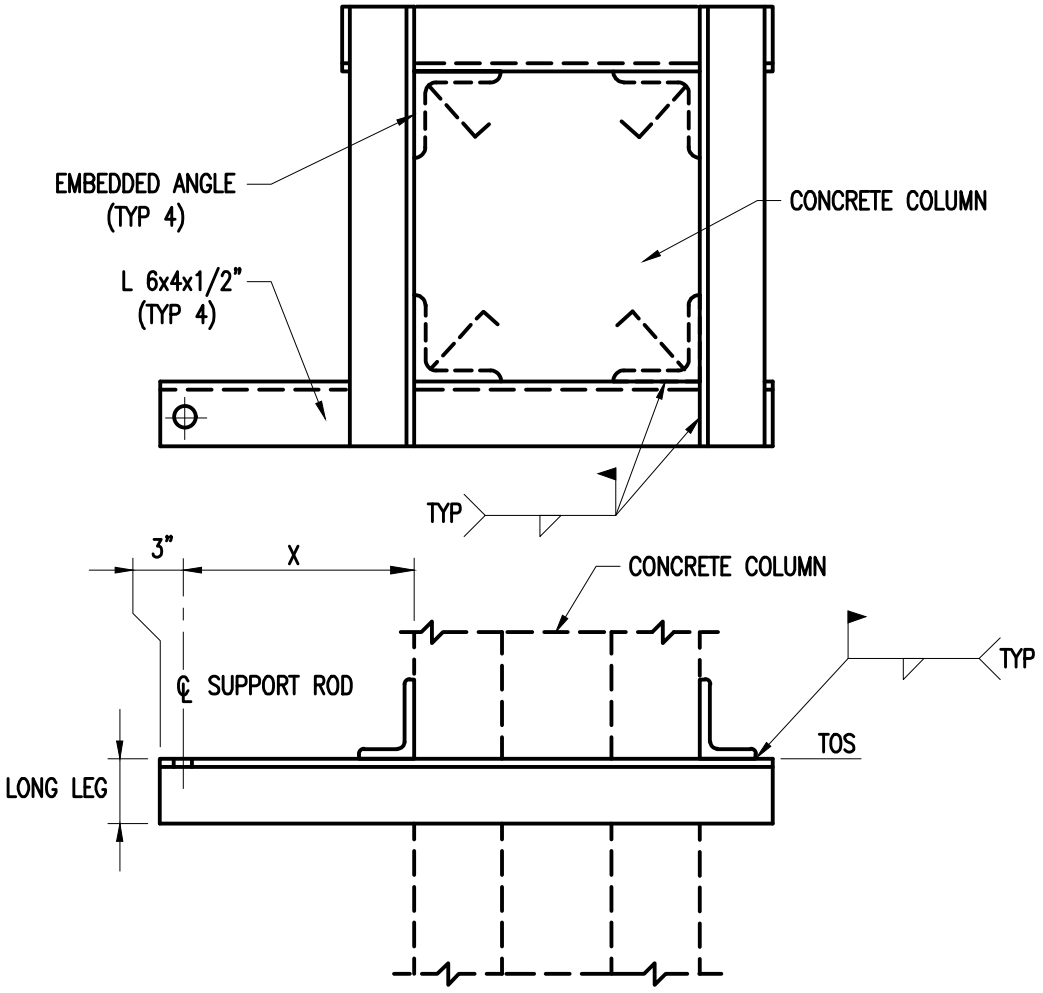
ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 29

MEDIUM DUTY
CONC COL
ATTACHMENT



NOTES:
1. SEE DRAWING FOR "X" AND TOS.
2. REVIEW DIMENSION "X" WITH STRUCTURAL DEPARTMENT.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 11 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

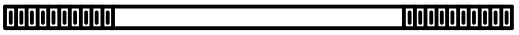
ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 30

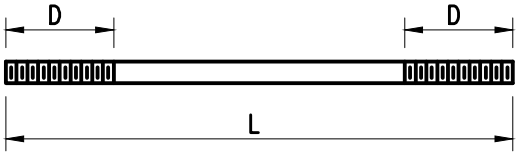
RH THREADS



MACHINE THREADED ROD
ANVIL NO. 140 OR EQUAL

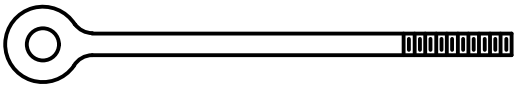
FIG 31

RIGHT & LEFT THREADS



MACHINE THREADED ROD
ANVIL NO. 253 OR EQUAL

FIG 32
RH THREADS



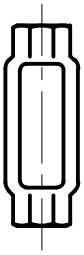
RIGHT HAND THREADED
WELDED EYE ROD
ANVIL NO. 278 OR EQUAL

FIG 32
LH THREADS

LEFT HAND THREADED
WELDED EYE ROD
ANVIL NO. 278L OR EQUAL

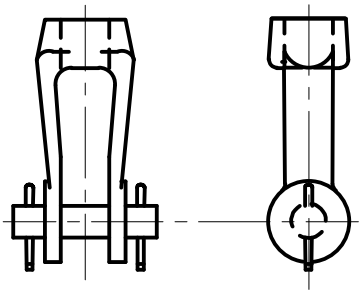
ROD SIZE	"D"	"L" MIN
3/8	4	10
1/2	4	10
5/8	4	10
3/4	4	10
7/8	4	10
1	4	10
1 1/4	5	12
1 1/2	6	14
1 3/4	7	16
2	8	18
2 1/4	9	20
2 1/2	10	22

FIG 34



FORGED STEEL TURNBUCKLE WITH 6" OPENING
ANVIL NO. 230 OR EQUAL

FIG 35



FORGED STEEL CLEVIS
ANVIL NO. 299 OR EQUAL
WITH PIN AND COTTERS

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 12 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A–8.5x11

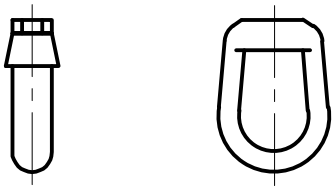
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

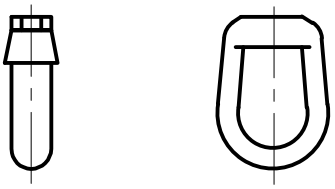
wood.

FIG 36



RIGHT HAND THREADED WELDLESS EYE NUT
ANVIL NO. 290 OR EQUAL

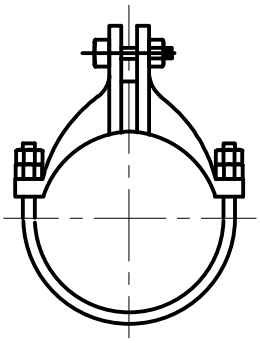
FIG 37



LEFT HAND THREADED WELDLESS EYE NUT
ANVIL NO. 290L OR EQUAL

FIG 38

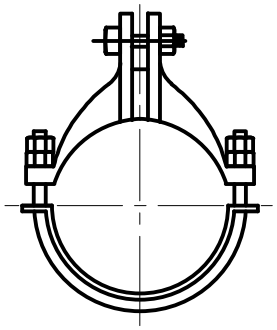
FIG 39



USE ON PIPE 4"–16" DIA

ALLOY STEEL PIPE CLAMP
ANVIL NO. 224 OR EQUAL

FIG 40



USE ON PIPE 10"–24" DIA

HEAVY DUTY ALLOY STEEL PIPE CLAMP
ANVIL NO. 246 OR EQUAL

FIG 41

RH THREADS



CONTINUOUS THREADED ROD
ANVIL NO. 146 OR EQUAL

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 13 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–001		REV: 0

ANSI A–8.5x11

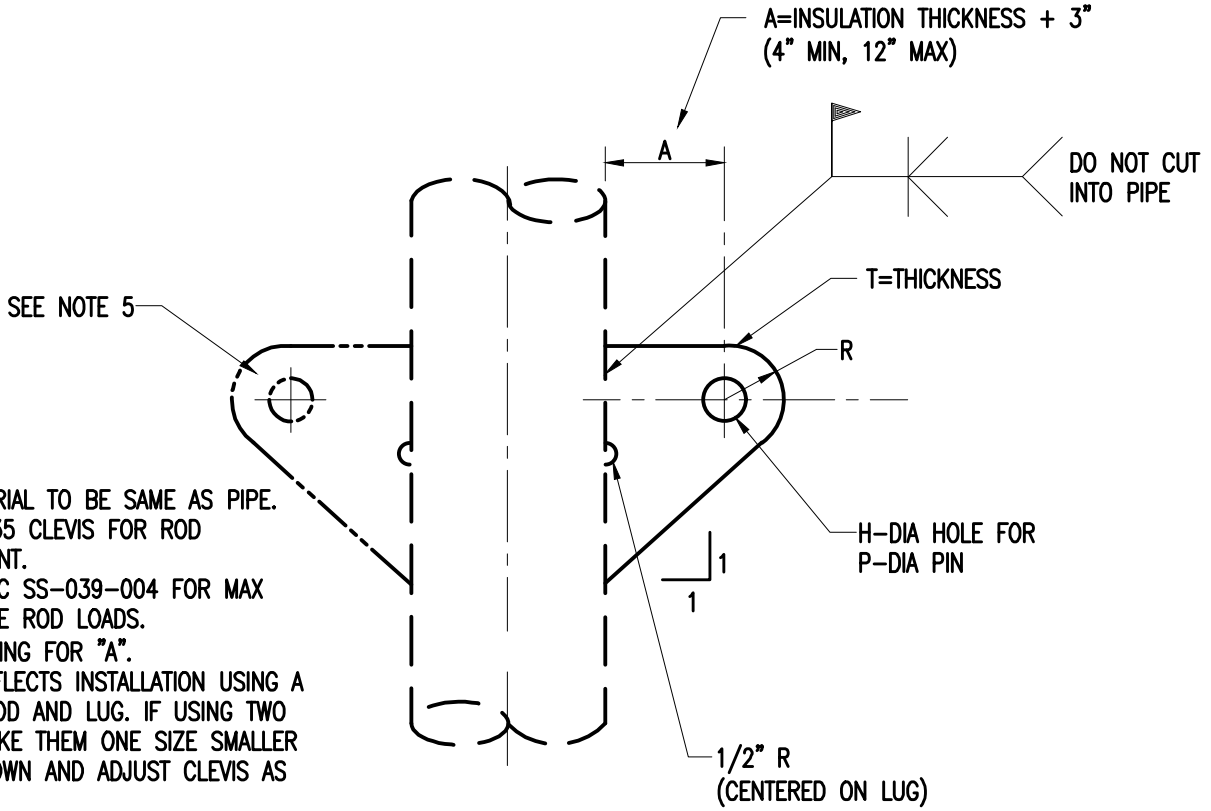
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 42



NOTES:
1. LUG MATERIAL TO BE SAME AS PIPE.
2. USE FIG 35 CLEVIS FOR ROD ATTACHMENT.
3. SEE SPEC SS-039-004 FOR MAX ALLOWABLE ROD LOADS.
4. SEE DRAWING FOR "A".
5. TABLE REFLECTS INSTALLATION USING A SINGLE ROD AND LUG. IF USING TWO RODS, MAKE THEM ONE SIZE SMALLER THAN SHOWN AND ADJUST CLEVIS AS REQUIRED.

PIPE SIZE	ROD SIZE	CLEVIS NO.	H	P	R	T
3"	1/2"	2	11/16"	5/8"	1 1/4"	1/4"
4"	5/8"	2	13/16"	3/4"	1 1/4"	1/2"
6"	3/4"	2 1/2	15/16"	7/8"	1 1/2"	1/2"
8"	3/4"	2 1/2	15/16"	7/8"	1 1/2"	1/2"
10"	7/8"	2 1/2	1 1/8"	1"	1 1/2"	1/2"
12"	7/8"	2 1/2	1 1/8"	1"	1 1/2"	1/2"
14"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
16"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
18"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
20"	1 1/4"	3	1 1/2"	1 3/8"	2"	5/8"
24"	1 1/2"	3 1/2	1 3/4"	1 5/8"	2"	3/4"
30"	1 3/4"	4	2"	1 7/8"	2 1/16"	3/4"
36"	2 1/4"	6	2 5/8"	2 1/2"	2 1/2"	3/4"

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 14 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

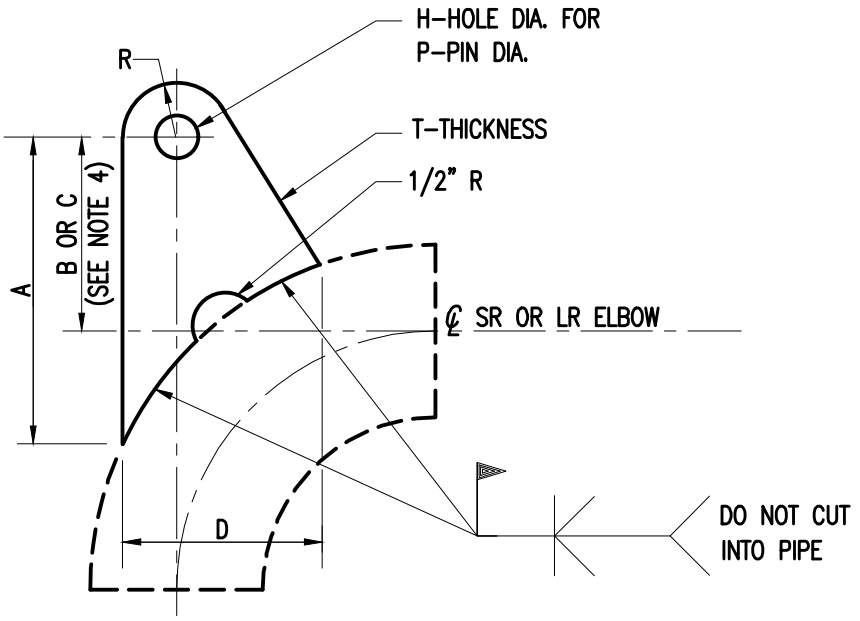
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 43



NOTES:
1. LUG MATERIAL TO BE SAME AS PIPE.
2. USE FIG 35 CLEVIS FOR ROD ATTACHMENT.
3. SEE SPECIFICATION SS–039–004 FOR MAXIMUM ALLOWABLE ROD LOADS.
4. DIMENSION "B" TO BE USED WITH SHORT RADIUS ELBOW, DIMENSION "C" TO BE USED WITH LONG RADIUS ELBOW.

PIPE SIZE	ROD SIZE	A	B (SR)	C (LR)	D	E	H	P	R	T	CLEVIS NO.
3"	1/2"	7"	6 1/8"	4 15/16"	3 3/4"	3/16"	11/16"	5/8"	1 1/4"	1/4"	2
4"	5/8"	8"	7 3/8"	5 15/16"	4"	3/8"	13/16"	3/4"	1 1/4"	1/2"	2
6"	3/4"	9"	8 13/16"	6 13/16"	4 1/2"	3/8"	15/16"	7/8"	1 1/2"	1/2"	2 1/2
8"	3/4"	10"	10 1/8"	7 1/2"	5"	3/8"	15/16"	7/8"	1 1/2"	1/2"	2 1/2
10"	7/8"	10"	10 1/2"	7 5/16"	6"	3/8"	1 1/8"	1"	1 1/2"	1/2"	2 1/2
12"	7/8"	11"	11 11/16"	7 15/16"	6"	3/8"	1 1/8"	1"	1 1/2"	1/2"	2 1/2
14"	1"	12"	12 3/16"	7 11/16"	7"	3/8"	1 1/4"	1 1/8"	1 1/2"	1/2"	3
16"	1"	13"	13 7/16"	8 5/16"	8"	3/8"	1 1/4"	1 1/8"	1 1/2"	1/2"	3
18"	1"	13"	13 11/16"	8"	8"	3/8"	1 1/4"	1 1/8"	1 1/2"	1/2"	3
20"	1 1/4"	14"	14 3/8"	8"	9"	1/2"	1 1/2"	1 3/8"	2"	5/8"	3
24"	1 1/2"	16"	16 3/8"	8 11/16"	9"	9/16"	1 3/4"	1 5/8"	2"	3/4"	3 1/2
30"	1 3/4"	17"	18 1/8"	8 11/16"	10"	9/16"	2"	1 7/8"	2 1/16"	3/4"	4
36"	2 1/4"	19"	20 1/4"	9"	11"	9/16"	2 5/8"	2 1/2"	2 1/2"	1"	6

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 15 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–001	REV: 0		

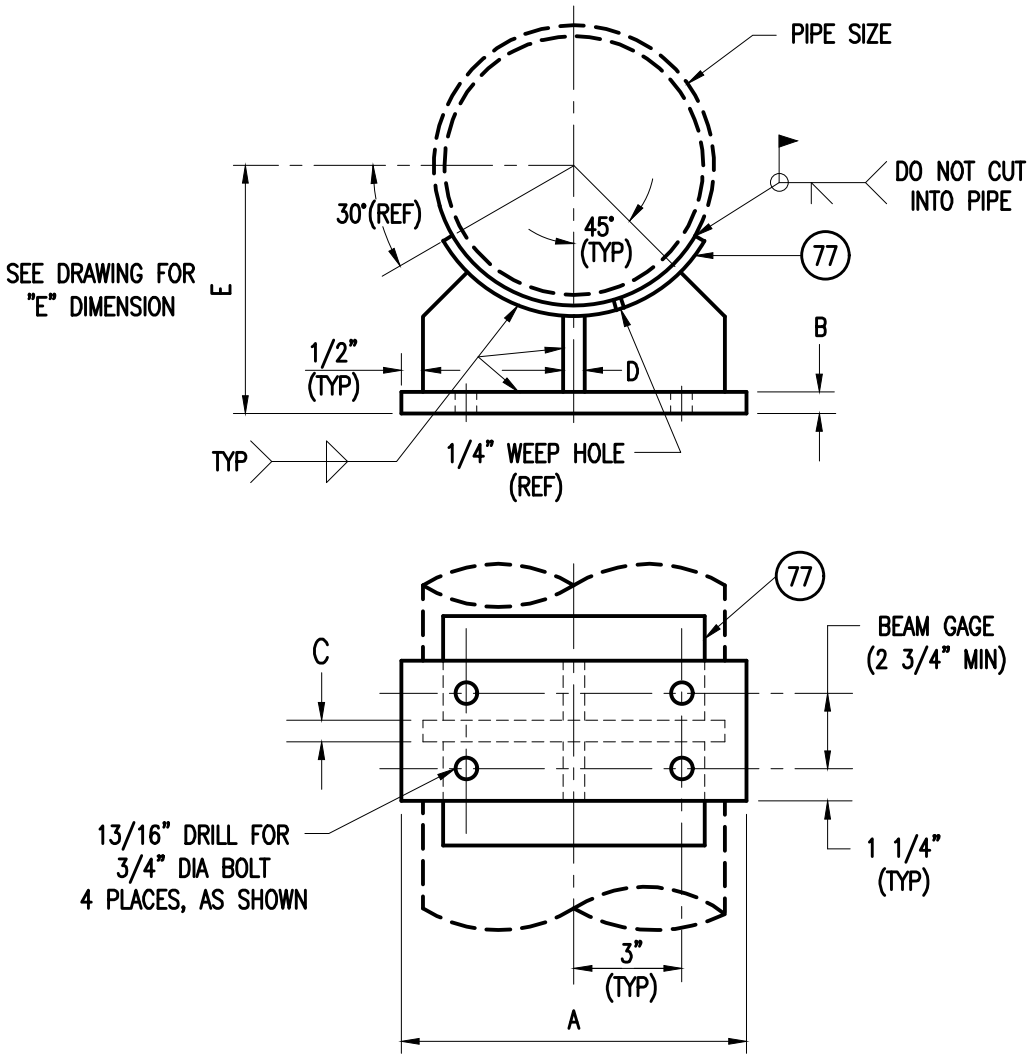
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 44



NOTES:
1. ALL CONTINUOUS FILLET WELD CONSTRUCTION.
2. BOTTOM PLATE AND GUSSETS TO BE ASTM A36 CARBON STEEL.
3. SADDLE (FIG 77) TO BE BENT TO ACTUAL OUTSIDE RADIUS OF PIPE.
4. SEE DRAWING FOR "E" DIMENSION.

PIPE SIZE	A	B	C	D
3"	8"	1/4"	1/4"	1/4"
4"	8"	1/4"	1/4"	1/4"
6"	8"	5/16"	5/16"	5/16"
8"	10"	3/8"	3/8"	3/8"
10"	12"	3/8"	3/8"	3/8"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 16 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

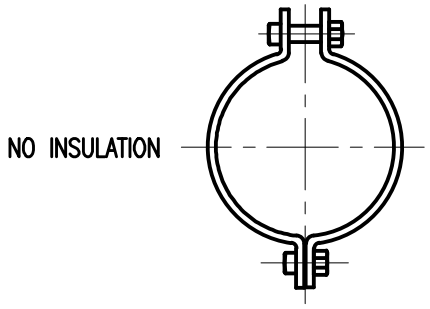
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

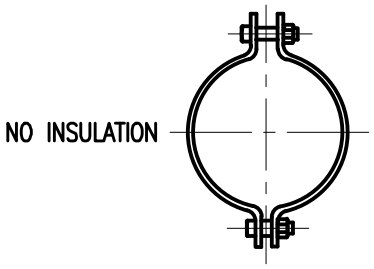
wood.

FIG 60



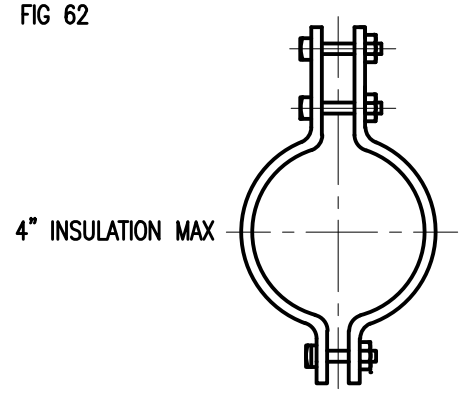
CARBON STEEL MEDIUM PIPE CLAMP
ANVIL NO. 212 OR EQUAL

FIG 61



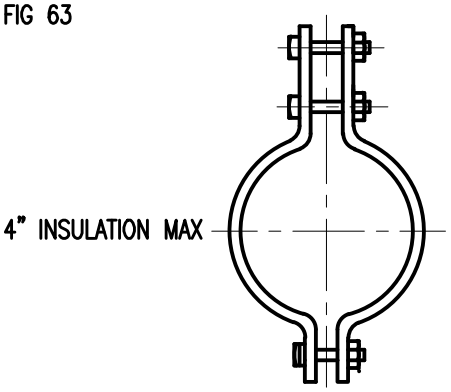
CARBON STEEL HEAVY PIPE CLAMP
ANVIL NO. 216 OR EQUAL

FIG 62



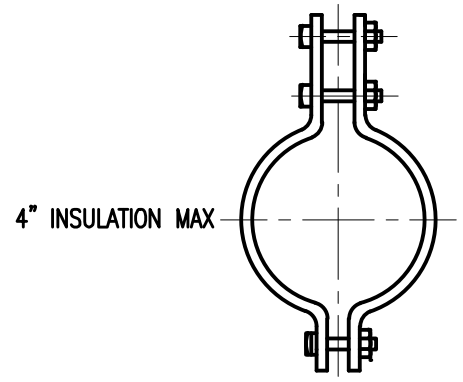
CARBON STEEL DOUBLE BOLT PIPE CLAMP
ANVIL NO. 295 OR EQUAL

FIG 63



CARBON STEEL HEAVY DUTY DOUBLE BOLT PIPE CLAMP
ANVIL NO. 295H OR EQUAL

FIG 64



ALLOY STEEL DOUBLE BOLT PIPE CLAMP
ANVIL NO. 295A OR EQUAL

FIG 65

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 17 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A–8.5x11

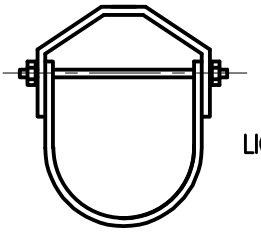
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 66



LIGHT LOADS

DO NOT USE FOR LOADS SHOWN IN
'S STANDARD SS-039-004

ADJUSTABLE CLEVIS
ANVIL NO. 260 OR EQUAL

FIG 67 & FIG 67S

FIG. 67S SPECIAL CARBON STEEL U-BOLT
ANVIL NO. 137S WITH HEX NUTS
OR EQUAL. DIM D & C EQUALS STD + 0.27"
UNLESS NOTED OTHERWISE

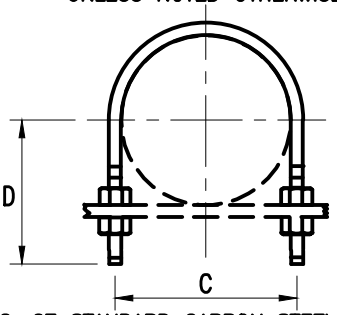
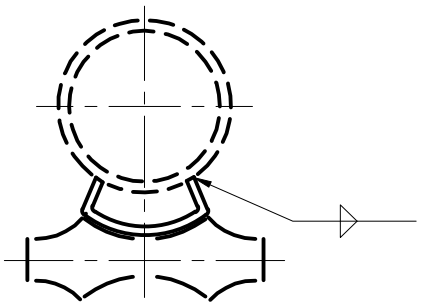


FIG. 67 STANDARD CARBON STEEL U-BOLT
ANVIL NO. 137 OR EQUAL

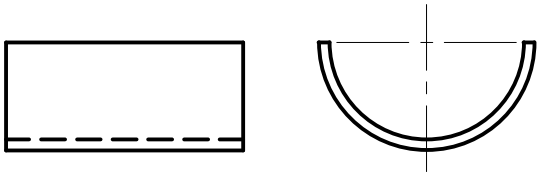
FIG 68

DO NOT USE FOR CHILLED WATER LINES



PIPE COVERING PROTECTION SADDLE
ANVIL NO. 160 THRU 166A OR EQUAL

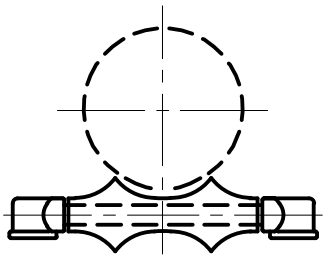
FIG 69



USE FOR PIPE WITH UP TO 2"
OF INSULATION

180 DEGREE INSULATION PROTECTION SHIELD
ANVIL NO. 167 OR EQUAL

FIG 70



SINGLE PIPE ROLL
ANVIL NO. 171

FIG 71

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 18 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

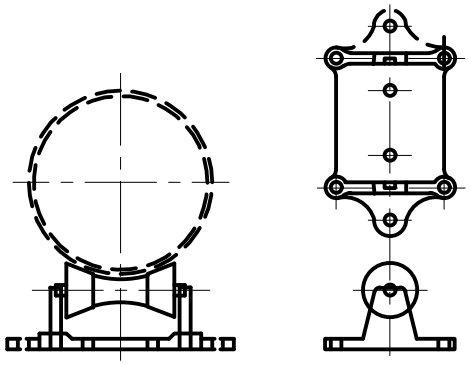
ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

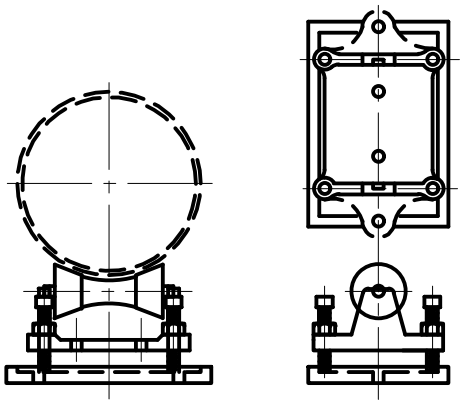
wood.

FIG 72



PIPE ROLL STAND
ANVIL NO. 271 OR EQUAL

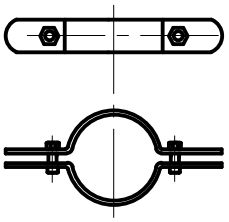
FIG 73



ADJUSTABLE PIPE ROLL STAND
ANVIL NO. 274 OR EQUAL

FIG 74

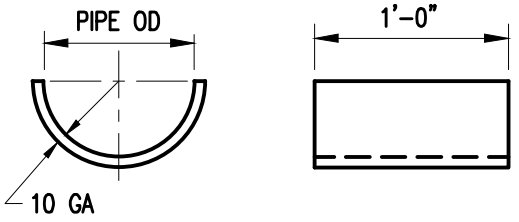
USE ON PIPE 8" DIA AND SMALLER



CARBON STEEL RISER CLAMP
ANVIL NO. 261 OR EQUAL

FIG 75

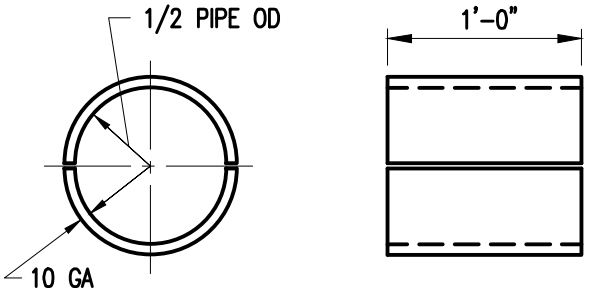
NOTES:
1. STITCH WELD TO PIPE
2. MATERIAL TO MATCH PIPE.



180° PIPE SADDLE

FIG 76

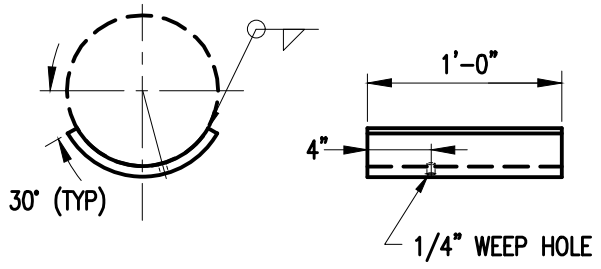
NOTES:
1. STITCH WELD TO PIPE.
2. MATERIAL TO MATCH PIPE.



360° PIPE SADDLE

FIG 77

NOTES:
1. MATERIAL AND THICKNESS TO MATCH PIPE.



120° PIPE SADDLE

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 19 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A–8.5x11

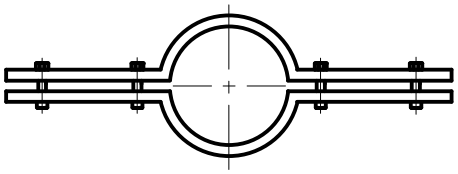
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 78



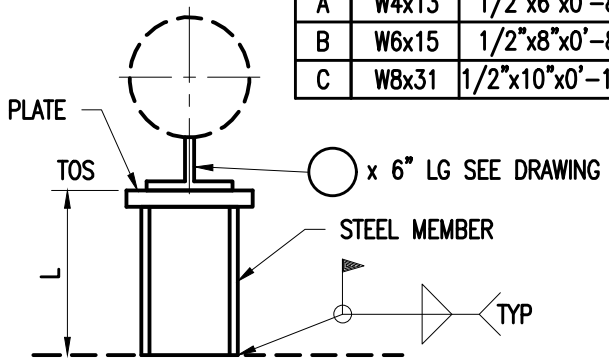
USE ON PIPE 10" DIA AND LARGER

CARBON STEEL RISER CLAMP STANDARD
ANVIL NO. 40

FIG 79

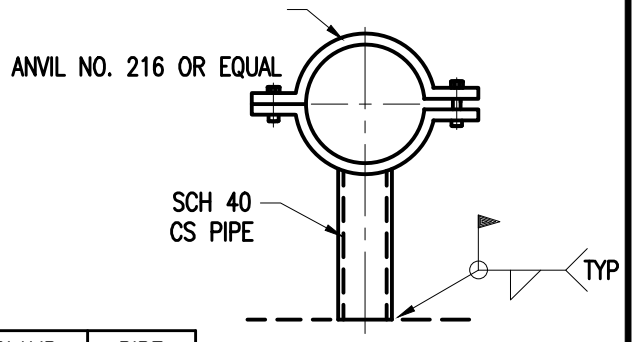
FIG 80 (A-C)

TYPE	MEMBER	PLATE SIZE
A	W4x13	1/2"x6"x0'-8" PLATE
B	W6x15	1/2"x8"x0'-8" PLATE
C	W8x31	1/2"x10"x0'-10" PLATE



NOTES:
1. SEE DRAWING FOR L, TOS AND INSUBLATION SHOE.

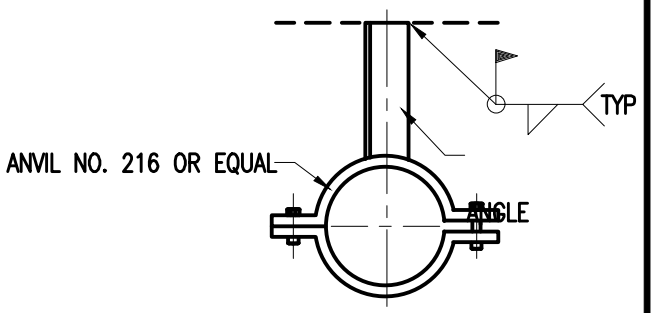
FIG 81



CLAMP SIZE	PIPE SIZE
3" & 4"	1 1/2"
6" & 8"	2"

FIG 82

FIG 83



CLAMP SIZE	ANGLE SIZE
3" & 4"	L1 1/2"x1 1/2"1/4"
6" & 8"	L2"x2"x3/8"

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 20 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

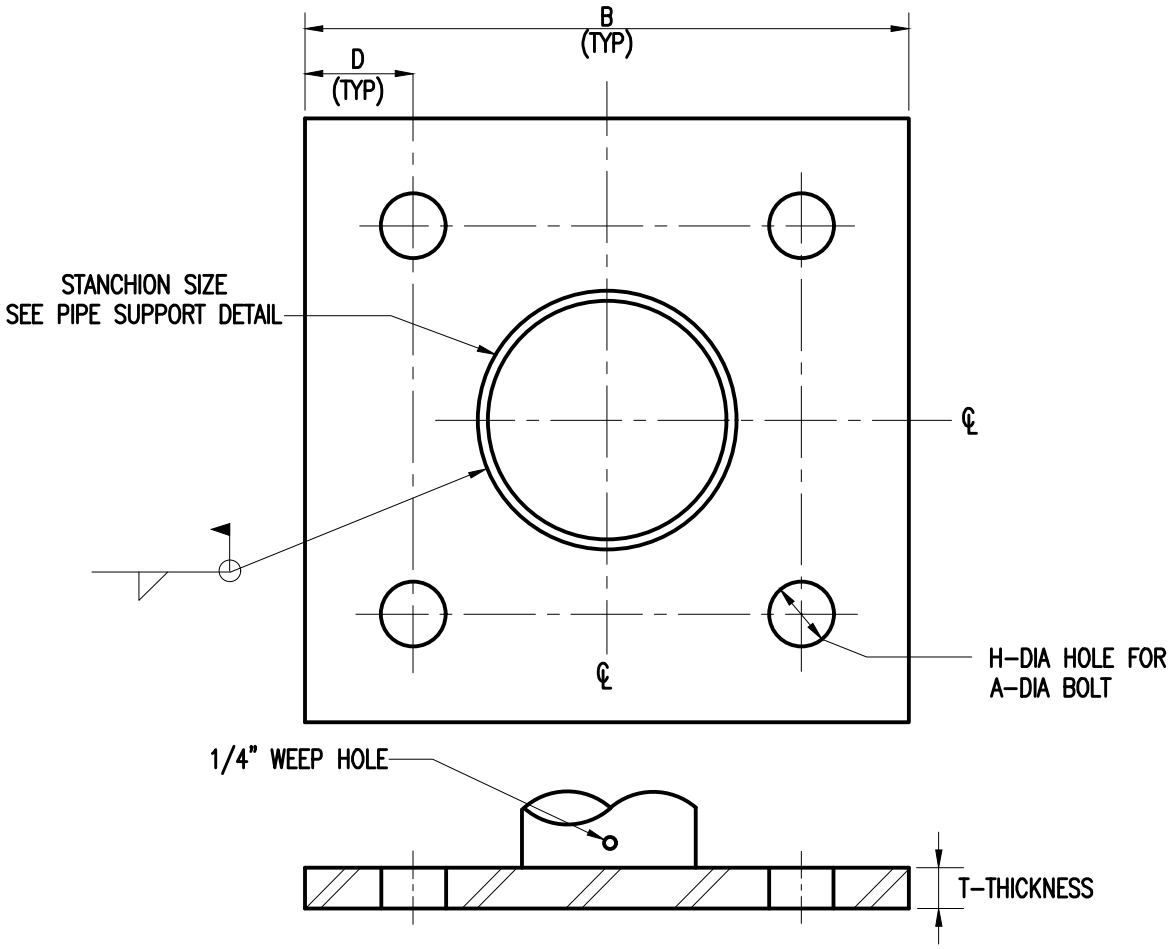
ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 84

PIPE COLUMN BASE PLATE



STANCHION SIZE	A	B	D	H	T
2"	3/4"	7"	1 1/2"	7/8"	3/4"
2 1/2"	3/4"	7 1/2"	1 1/2"	7/8"	3/4"
3"	3/4"	8"	1 1/2"	7/8"	3/4"
4"	3/4"	9"	1 1/2"	7/8"	3/4"
6"	1"	11 1/2"	2"	1 1/8"	1"
8"	1"	13"	2"	1 1/8"	1"
10"	1"	14 1/2"	2"	1 1/8"	1"
12"	1"	16"	2"	1 1/8"	1"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 21 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–001		REV: 0

ANSI A–8.5x11

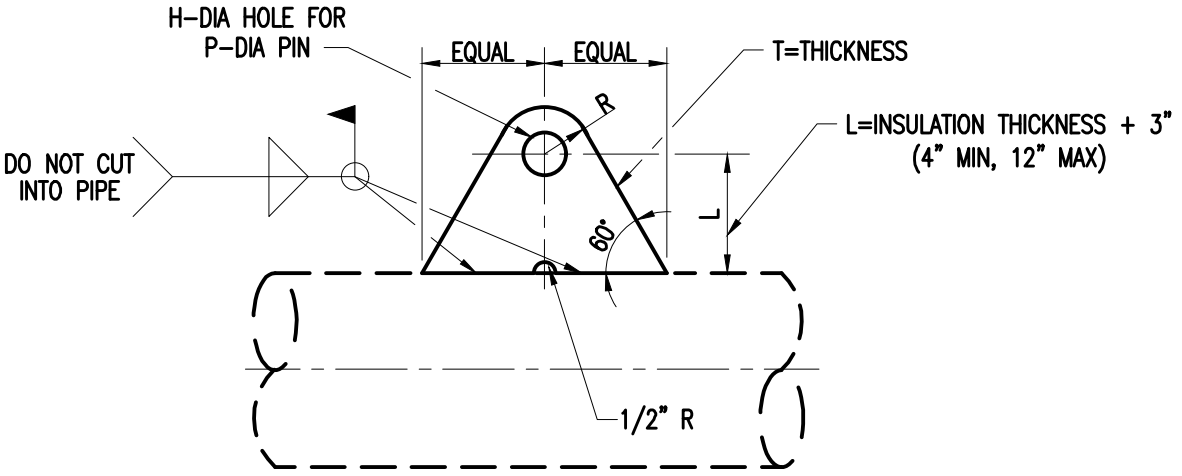
ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 85



NOTES:
1. LUG MATERIAL TO BE SAME AS PIPE.
2. USE FIG 35 CLEVIS FOR ROD ATTACHMENT.
3. SEE SPECIFICATION SS–039–004 FOR MAXIMUM ALLOWABLE ROD LOADS.
4. SEE DRAWING FOR "L".

PIPE SIZE	ROD SIZE	CLEVIS NO.	H	P	R	T
3"	1/2"	2	11/16"	5/8"	1 1/4"	1/4"
4"	5/8"	2	13/16"	3/4"	1 1/4"	1/2"
6"	3/4"	2 1/2	15/16"	7/8"	1 1/4"	1/2"
8"	3/4"	2 1/2	15/16"	7/8"	1 1/4"	1/2"
10"	7/8"	2 1/2	1 1/8"	1"	1 1/4"	1/2"
12"	7/8"	2 1/2	1 1/8"	1"	1 1/4"	1/2"
14"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
16"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
18"	1"	3	1 1/4"	1 1/8"	1 1/2"	1/2"
20"	1 1/4"	3	1 1/2"	1 3/8"	2"	5/8"
24"	1 1/2"	3 1/2	1 3/4"	1 5/8"	2 1/2"	3/4"
30"	1 3/4"	4	2"	1 7/8"	2 1/2"	3/4"
36"	2 1/4"	6	2 5/8"	2 1/2"	3"	3/4"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
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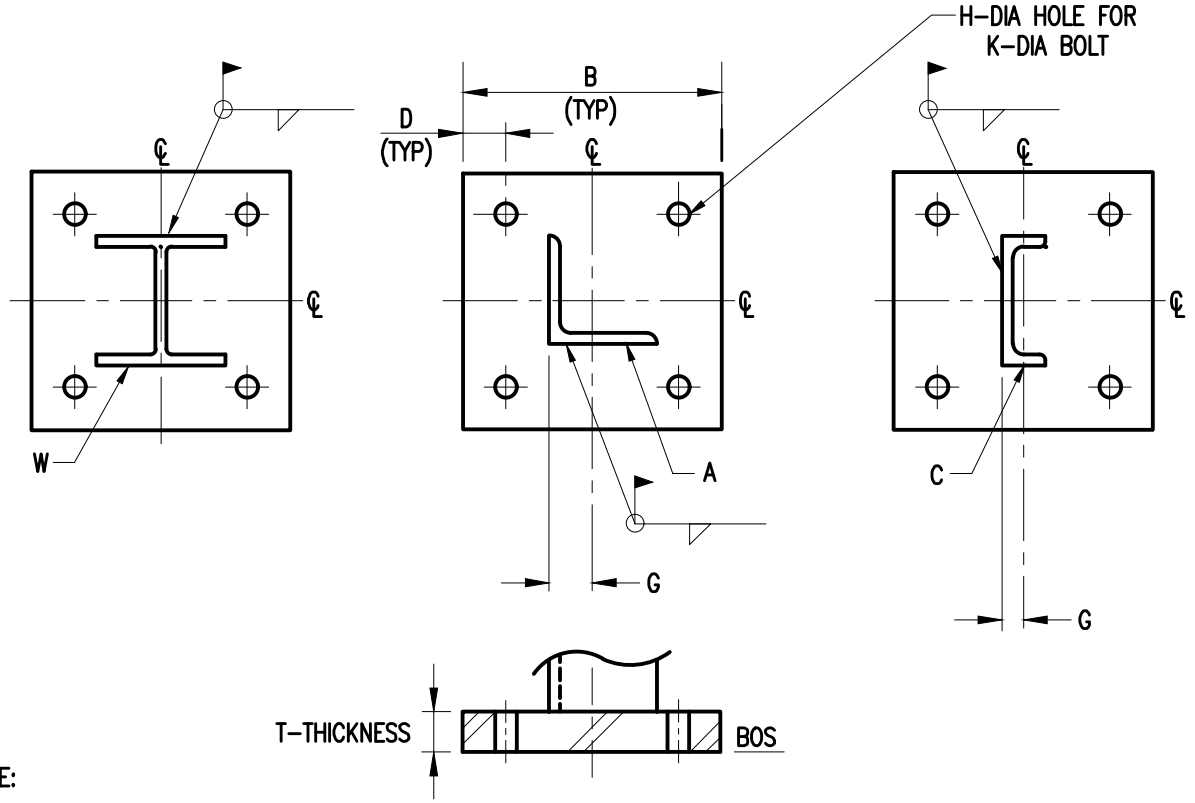
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STANDARD DETAIL

wood.

FIG 86 (A–H)

STRUCTURAL COLUMN BASE PLATES



NOTE:

1. SEE DRAWING FOR BOS OR TOS IF STRUCTURAL COMPONENT IS HORIZONTAL.

TYPE	A ANGLE	C CHANNEL	W W FLANGE	B	D	H	K	T	G
A	L2x2x1/4"	—	—	7 1/2"	1 1/2"	7/8"	3/4"	3/4"	9/16"
B	L2 1/2x2 1/2x1/4"	—	—	8"	1 1/2"	7/8"	3/4"	3/4"	3/4"
C	L3x3x3/8"	—	—	8 1/2"	1 1/2"	7/8"	3/4"	3/4"	7/8"
D	L4x4x3/8"	—	—	9"	1 1/2"	7/8"	3/4"	3/4"	1 1/8"
E	—	—	W4x13	10"	1 1/2"	7/8"	3/4"	3/4"	—
F	—	—	W6x15	13"	2"	1 1/8"	1"	1"	—
G	—	C3x4.1	—	9"	1 1/2"	7/8"	3/4"	3/4"	7/16"
H	—	C4x5.4	—	9"	1 1/2"	7/8"	3/4"	3/4"	7/16"

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ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 87

NOTES:
1. "D" IS NOMINAL PIPE DIAMETER.
2. IS TOC +1 1/2"

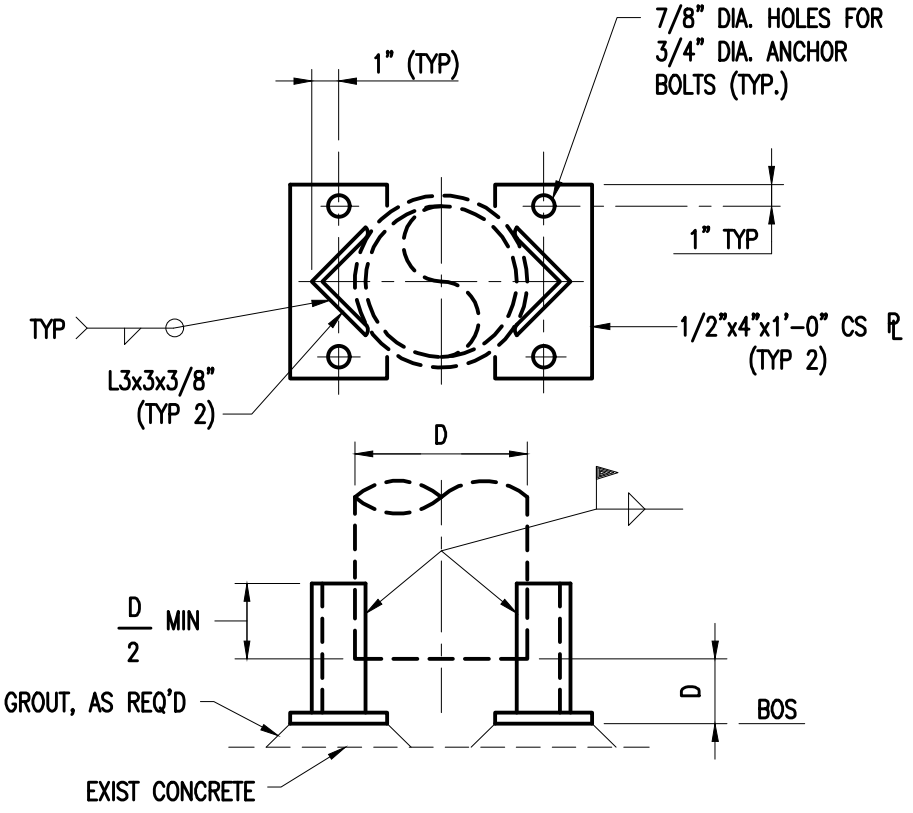
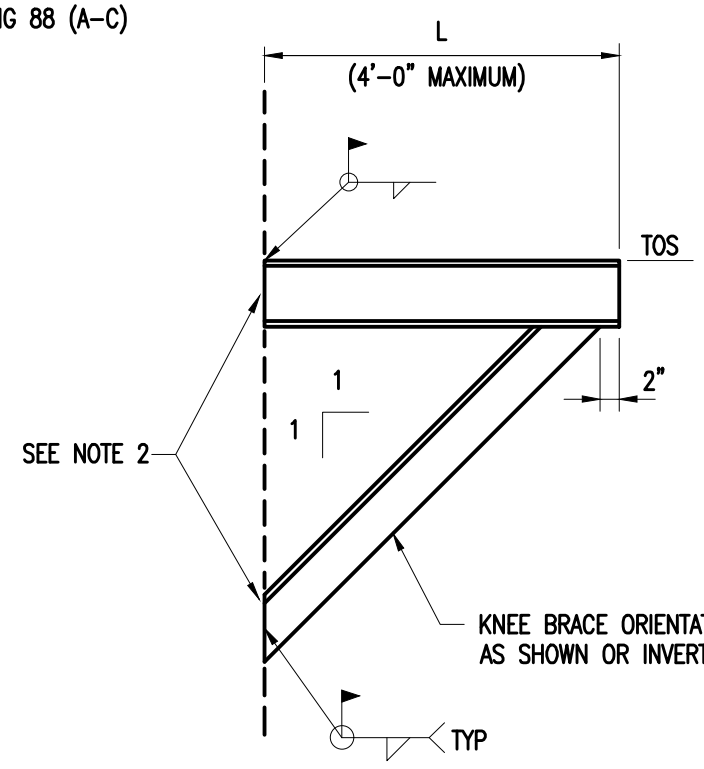


FIG 88 (A-C)



TYPE	HORIZ BEAM	KNEE BRACE	MAX LOAD (LB)
A	L4x4x1/2"	L3x3x3/8"	12500
B	W6x15	WT4x9	30000
C	W8x31	W4x13	40000

NOTES:
1. SEE DRAWING FOR "L" AND TOS.
2. VERIFY THAT ATTACHMENT POINTS ARE ADEQUATE FOR LOADS BEING INTRODUCED.

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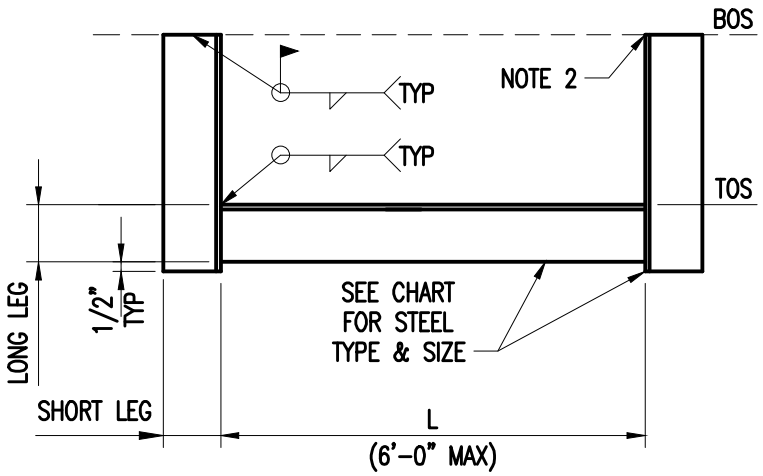
ANSI A-8.5x11

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STANDARD DETAIL

wood.

FIG 89 (A–F)



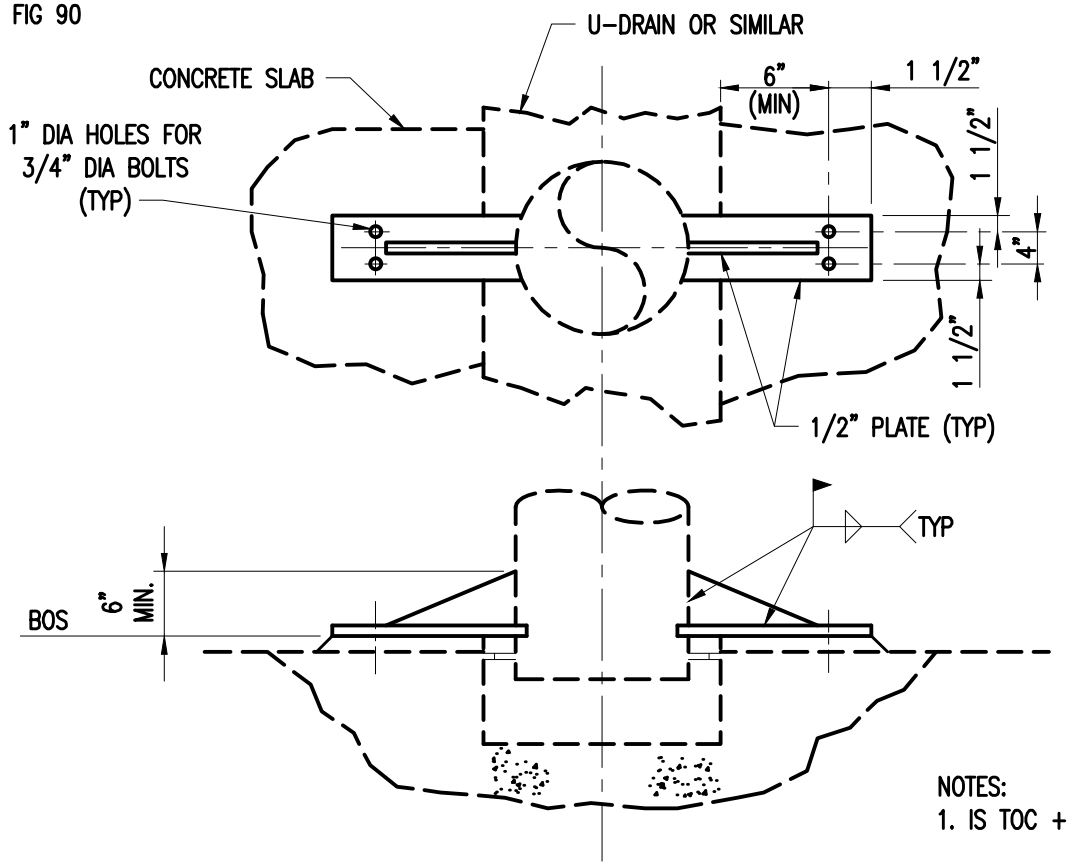
ELEVATION

TYPE	STEEL MEMBERS	
	HORIZONTAL	VERTICAL
A	L2X2X3/8"	L2X2X3/8"
B	L3X3X3/8"	L3X3X3/8"
C	L4X3X3/8"	L4X3X3/8"
D	W4X13	W4x13
E	W6x15	L6x4x3/8"
F	W8X18	L6x4x3/8"

NOTES:
1. SEE DRAWING FOR TOS AND "L".
2. PROVIDE 1/2" THK CS PLATE IF REQUIRED FOR MAKE–UP.
3. SEE FIG 103 FOR ALLOWABLE LOADS ON HORIZONTAL MEMBERS.
4. MAY BE USED INVERTED WITH HORIZONTAL MEMBER ROTATED 180°.

FIG 90

OVERFLOW SUPPORT IN U–DRAIN



NOTES:
1. IS TOC +1 1/2"

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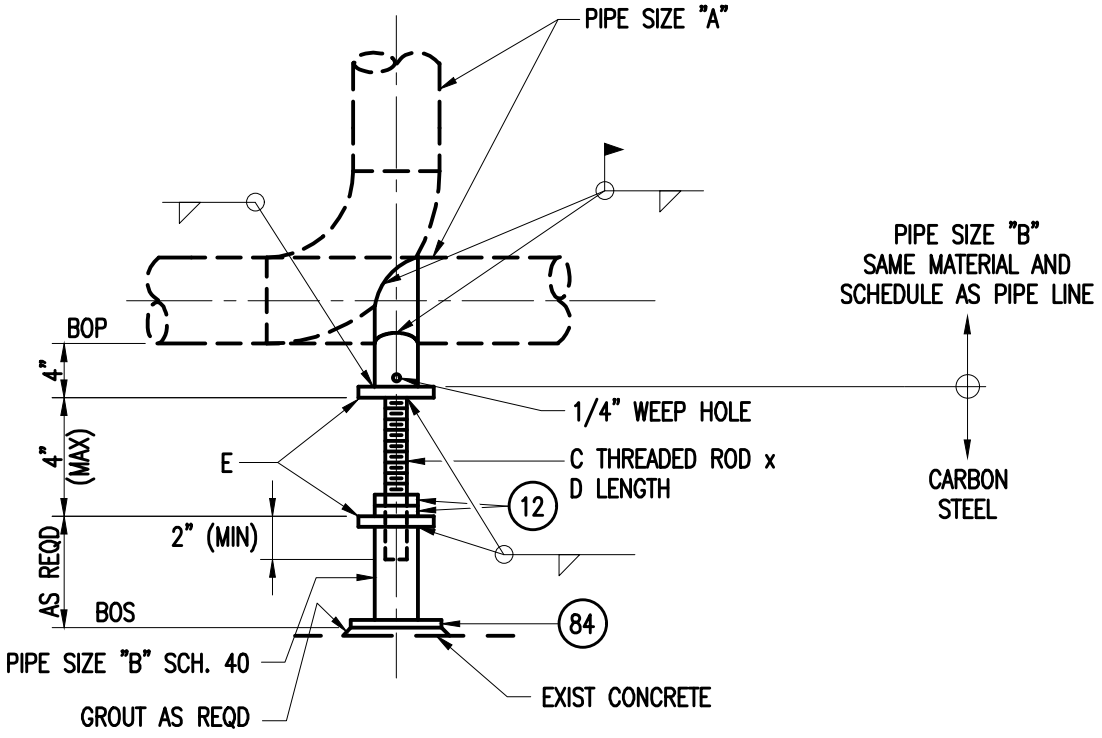
ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 91



PIPE SIZE A	PIPE SIZE B	C	D	E
3"–8"	2"	3/4"	6"	1/2"x6"ø W/ 13/16"øHOLE
10"–18"	3"	1"	6"	1/2"x7"ø W/ 1 1/16"øHOLE
20"–24"	4"	1 1/2"	6"	1/2"x8"ø W/ 1 5/16"øHOLE

NOTES:
1. IS TOC +1 1/2"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
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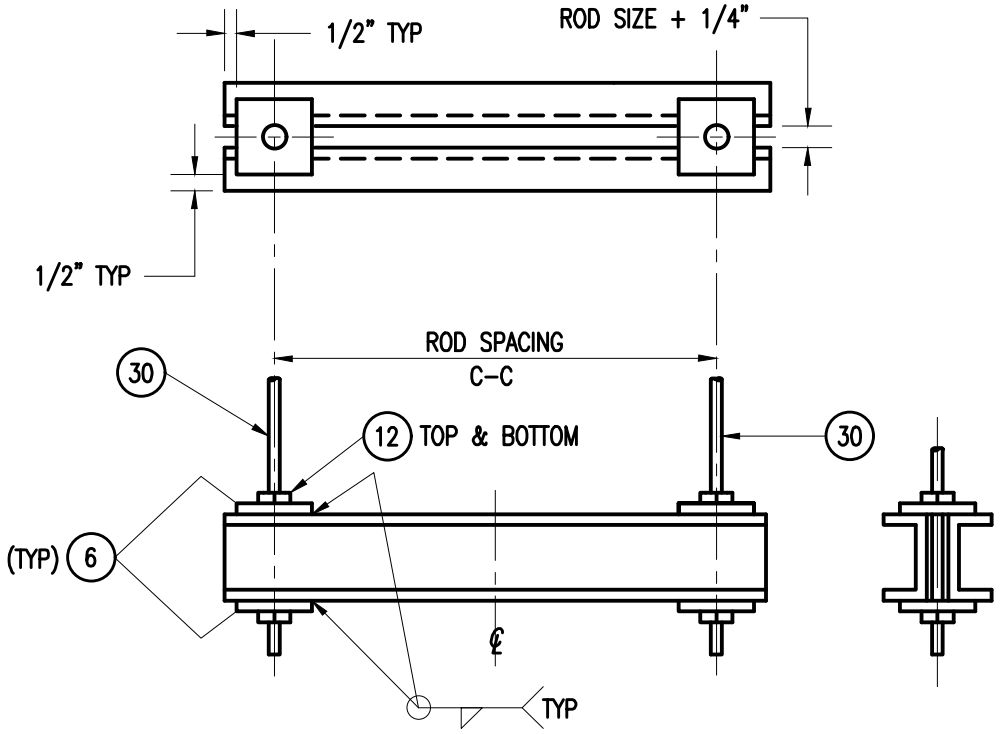
ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 93 (A–E)



NOTES:

1. SEE DRAWING FOR FIG 30 AND C–C.

TYPE	CHANNEL SIZE	MAX LOAD AT CENTER OF SPAN (LB) & ROD SIZE											
		3'–0"		4'–0"		5'–0"		6'–0"		7'–0"		8'–0"	
A	C3x4.1	4900	7/8"	3700	3/4"	2900	5/8"	2400	5/8"	2100	1/2"	1800	1/2"
B	C4x5.4	8400	1"	6300	1"	5100	7/8"	4200	3/4"	3600	3/4"	3200	5/8"
C	C5x6.7	13300	1 1/4"	10000	1 1/4"	8000	1"	6700	1"	5700	7/8"	5000	7/8"
D	C6x8.2	19100	1 3/4"	14300	1 1/2"	11500	1 1/4"	9600	1 1/4"	8200	1"	7200	1"
E	C8x11.5	36000	2 1/4"	27000	2"	21600	1 3/4"	18000	1 1/2"	15400	1 1/2"	13500	1 1/4"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
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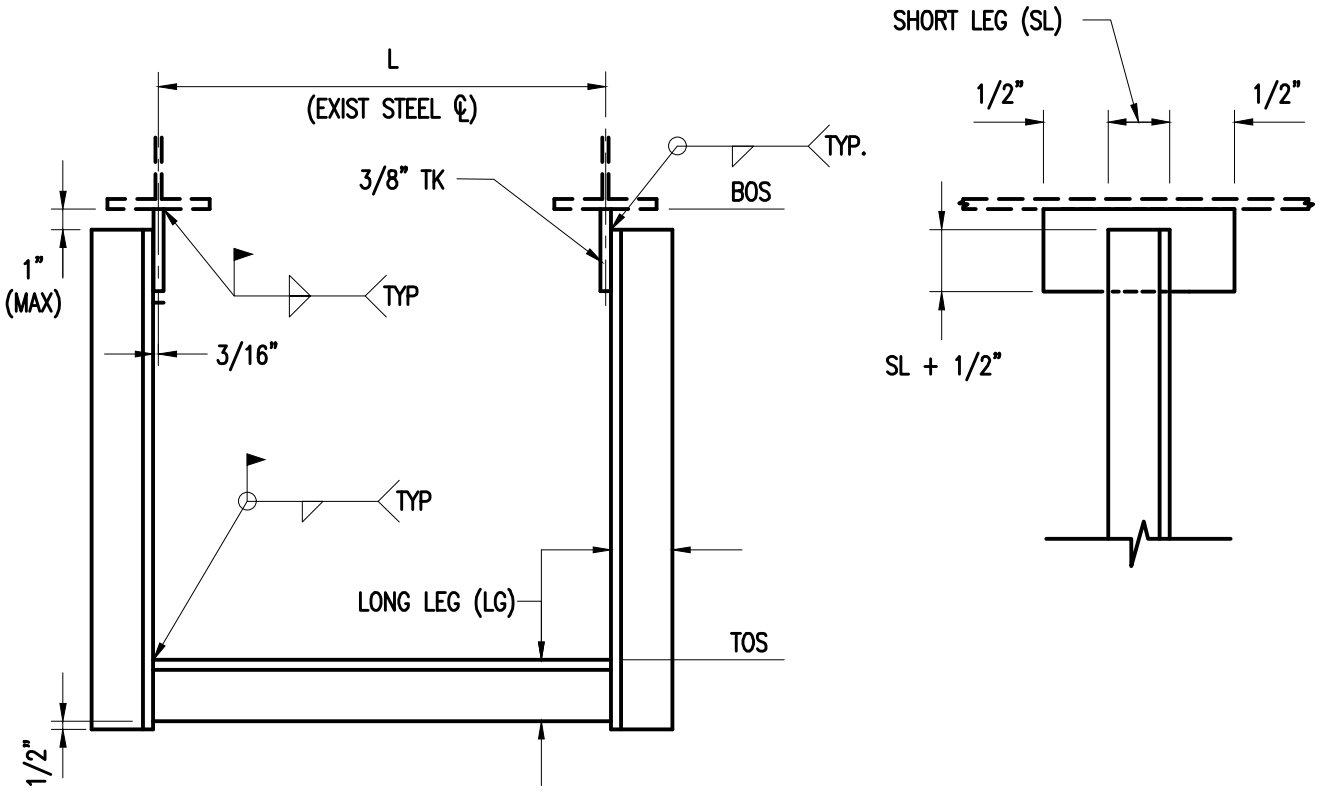
ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 94 (A–E)



		ALLOWABLE CONCENTRATED LOAD (LB) AT ℄ SPAN										
TYPE	ANGLE SIZE	10"	1'–0"	1'–6"	2'–0"	2'–6"	3'–0"	4'–0"	5'–0"	6'–0"	7'–0"	8'–0"
A	L2x2x3/8"	2120	1760	1180	880	710	590	–	–	–	–	–
B	L3x3x3/8"	–	3860	2580	1930	1540	1290	970	–	–	–	–
C	L4x3x3/8"	–	–	–	–	–	3330	2500	2000	1670	1430	1250
D	L5x3x3/8"	–	–	–	–	–	4900	3660	2930	2440	2100	1830
E	L6x4x3/8"	–	–	–	–	–	7350	5500	4400	3670	3140	2750

NOTES:

1. SEE DRAWING FOR "L" AND TOS.

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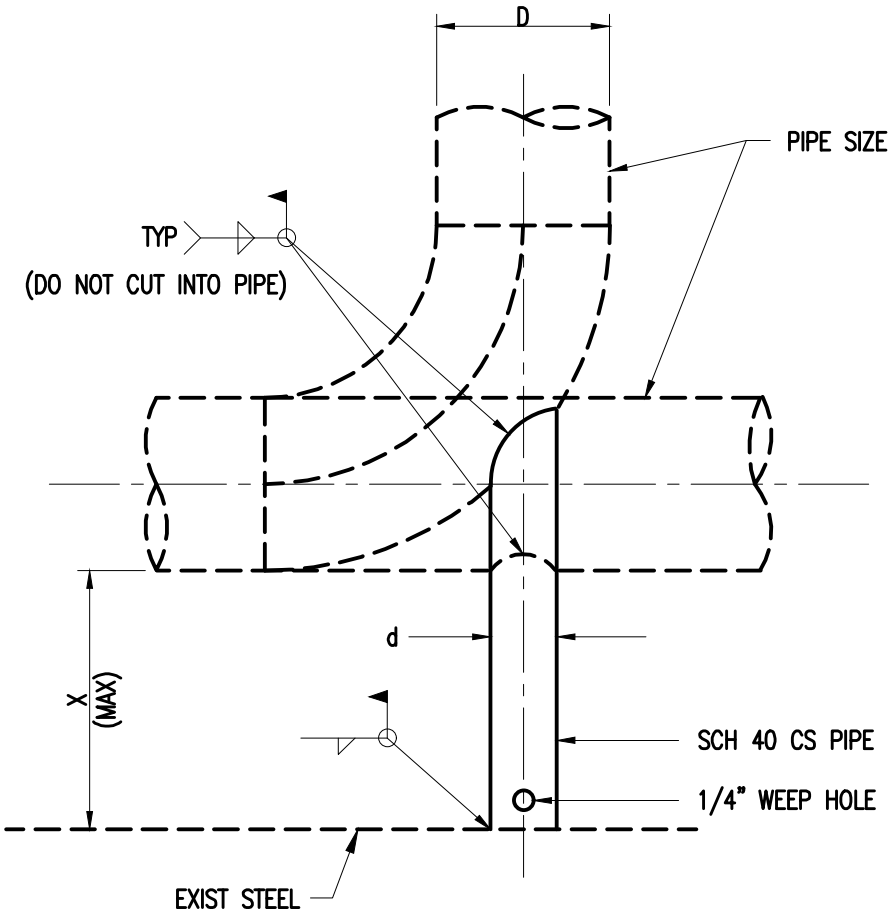
ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 95



PIPE SIZE "D"	"X"	d
3"– 4"	5'–6"	2"
6" & 8"	5'–0"	2"
10" & 12"	4'–6"	3"
14" & 16"	4'–0"	4"
18"– 24"	3'–6"	4"

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ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 97–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

6" INSULATION SHOE
FOR 12" PIPE & LARGER

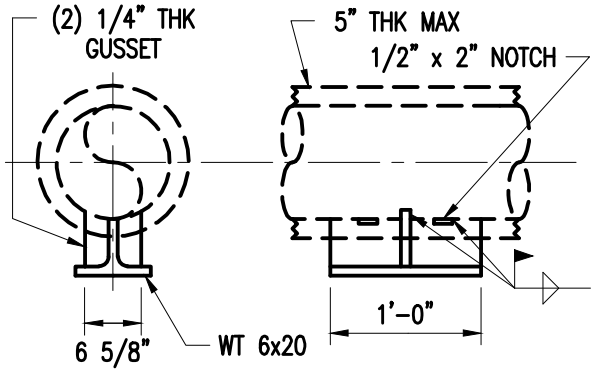


FIG 98–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

4" INSULATION SHOE
FOR 12" PIPE & LARGER

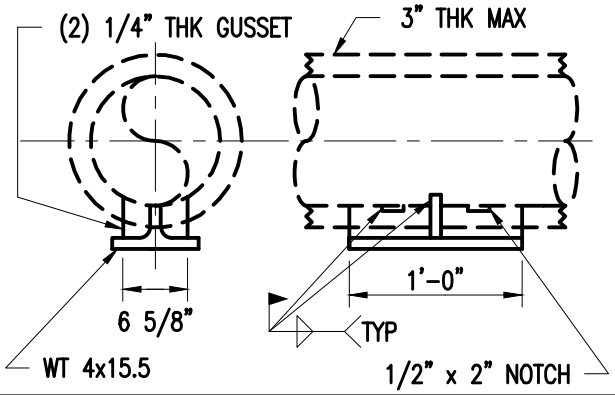


FIG 99–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

6" INSULATION SHOE
FOR 10" PIPE & SMALLER

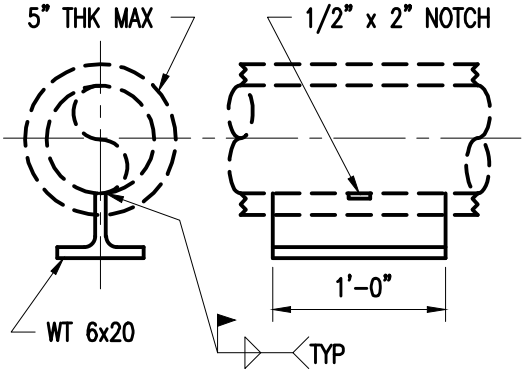


FIG 100–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

4" INSULATION SHOE
FOR 10" PIPE & SMALLER

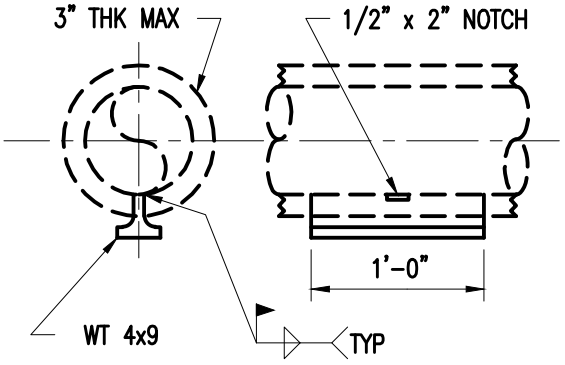


FIG 101–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

INSULATION SHOE GUIDE

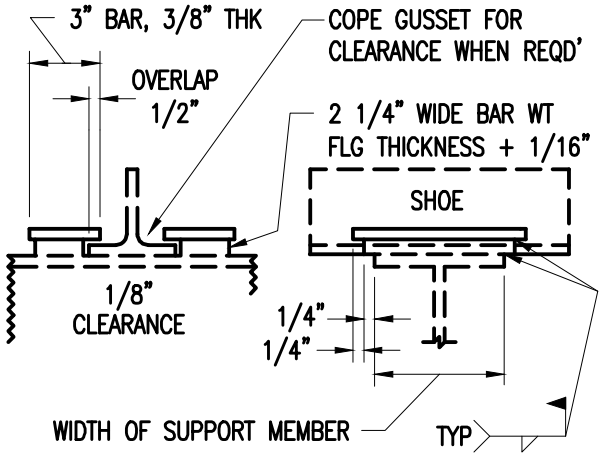
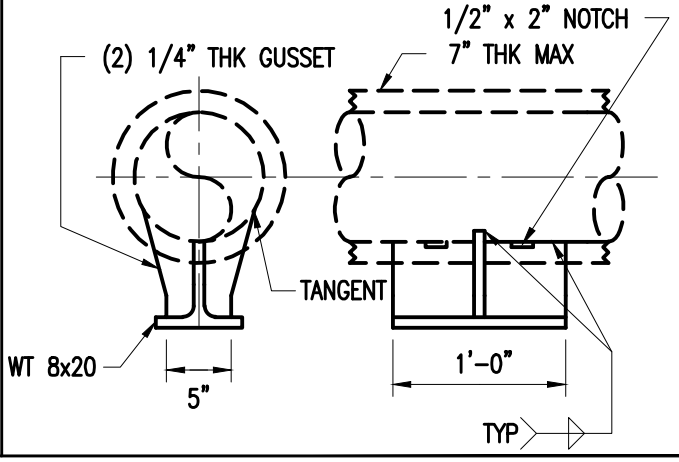


FIG 102–SEE PIPE SUPPORT SPECIFICATION SS–039–002 FOR MATERIAL.

8" INSULATION SHOE
FOR 12" PIPE & LARGER



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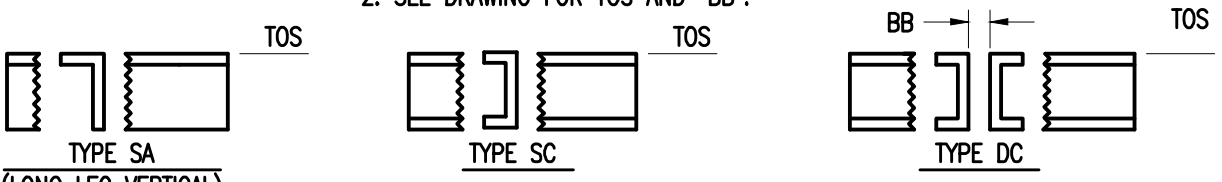
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STANDARD DETAIL

wood.

FIG 103

NOTES:
1. "BB" EQUALS ROD DIA + 1/8".
2. SEE DRAWING FOR TOS AND "BB".



TYPE SA (LONG LEG VERTICAL) | TYPE SC | TYPE DC

	TYPE & SIZE	MEMBER	BB (SEE NOTE 1)	ALLOWABLE CONCENTRATED LOAD (LB) AT CENTER OF SPAN (FT)					
				3	4	5	6	7	8
BEAM SINGLE	W4	W4x13		12665	9500	7600	6330	5430	4750
	W6	W6x15		–	–	14800	12330	10115	8850
	W8	W8x18		–	–	24000	18000	15500	13500
ANGLE SINGLE	SA2	L2x2x3/8"		590	–	–	–	–	–
	SA3	L3x3x3/8"		1290	970	770	645	555	485
	SA4	L4x3x3/8"		3330	2500	2000	1670	1430	1250
	SA5	L5x3x3/8"		4900	3660	2930	2440	2100	1830
	SA6	L6x4x3/8"		7350	5500	4400	3670	3140	2750
SINGLE CHANNEL	SC4	C4x5.4		4220	3170	2540	2060	1510	1160
	SC5	C5x6.7		6670	5000	4000	3120	2290	1750
	SC6	C6x8.2		9560	7170	5740	4370	3220	2460
	SC7	C7x9.8		13300	10000	8000	6050	4450	3420
	SC8	C8x11.5		18000	13500	10800	8300	6050	4650
	SC9	C9x13.4		23300	17500	14000	10800	8000	6080
	SC10	C10x15.3		29800	22400	17900	14100	10300	7900
DOUBLE CHANNEL	DC3	C3][x4.1		5100	3850	3100	2525	1860	1425
	DC4	C4][x5.4		8440	6340	5080	4220	3620	3170
	DC5	C5][x6.7		13340	10000	8000	6660	5720	5000
	DC6	C6][x8.2		19120	14340	11480	9580	8200	7180
	DC7	C7][x9.8		26600	20000	16000	13300	11440	10000
	DC8	C8][x11.5		36000	27000	21600	18000	15440	13500
	DC9	C9][x13.4		–	35000	28000	23300	20000	17500
	DC10	C10][x15.3		–	–	35800	29800	25600	22400

THE ABOVE TABLE LISTS THE TYPE AND SIZE NUMBERS ASSIGNED TO THE MOST COMMONLY USED SUPPLEMENTAL FRAMING MEMBERS. TO AID IN THE SELECTION OF SUPPLEMENTARY MEMBER, THE ALLOWABLE CONCENTRATED LOAD THAT MAY BE SUPPORTED AT THE CENTER OF THE SPAN IS TABULATED FOR SPANS RANGING FROM THREE TO EIGHT FEET.

LOADS ARE DESIGNED IN ACCORDANCE WITH AISC SPECIFICATIONS.

EXAMPLE FIG 103(SC6–7) INDICATES A 6 INCH CHANNEL, AT 8.2 LB/FT THAT IS 7 FEET LONG.

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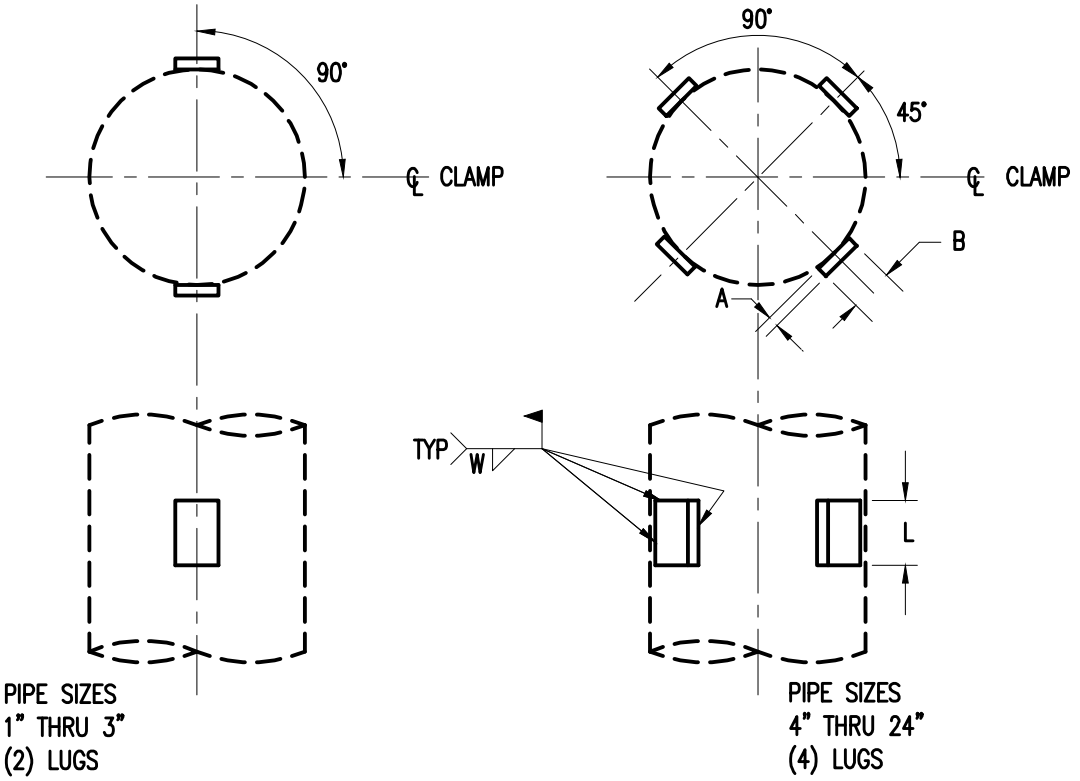
ANSI A–8.5x11

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STANDARD DETAIL

wood.

FIG 104



NOTES:
1. SHEAR LUG MATERIAL TO MATCH PIPE MATERIAL.

LUG SIZE	MAX RATED LOAD @ 650 DEG F (LB)	PIPE SIZE	BAR SIZE A x B	LENGTH L	W
1	1500	1" THRU 1 1/2"	1/4"x1/2"	2"	3/16"
2	3000	2" THRU 3"	1/4"x3/4"	2"	3/16"
3	5000	4" THRU 5"	3/8"x1"	3"	1/4"
4	10000	6" THRU 10"	1/2"x1 1/2"	3"	3/8"
5	15000	12" THRU 14"	3/4"x 2"	3"	9/16"
6	30000	16" THRU 24"	1" x 2"	4"	5/8"

CHART LOADS ARE CORNER & LADA, FIG 488

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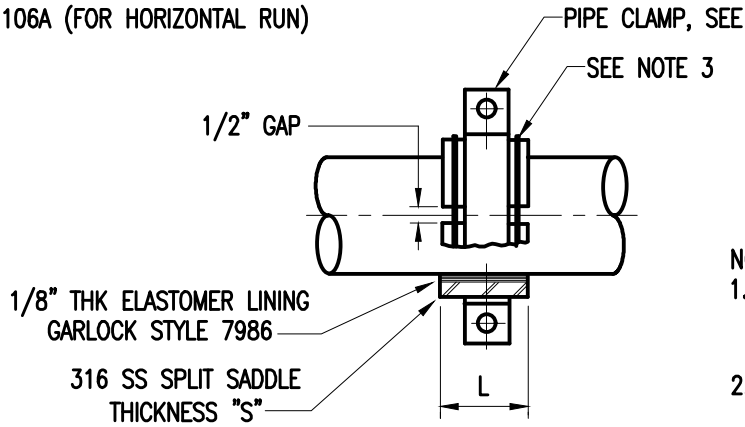
ANSI A–8.5x11

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wood.

FIG 106A (FOR HORIZONTAL RUN)

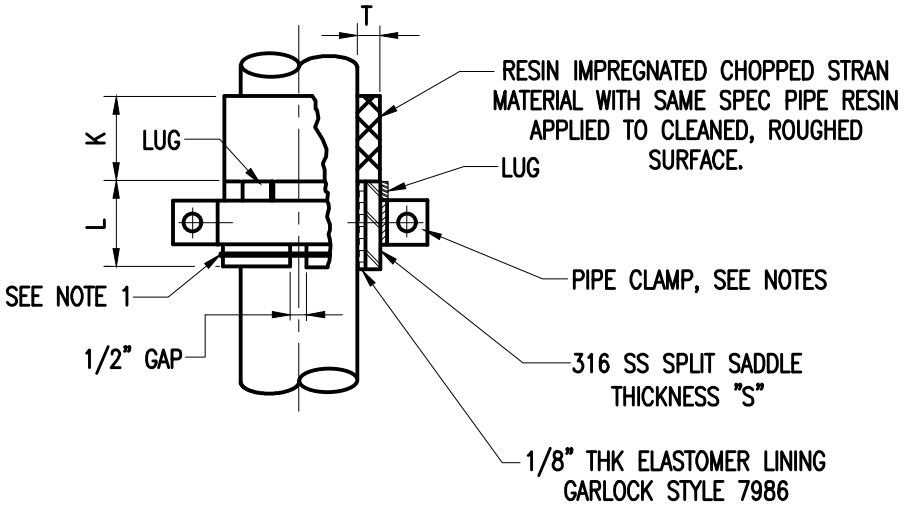


NOTES:
1. PIPE CLAMPS ARE SIMILAR TO FIG 60 UP TO 8" DIA PIPE, AND FIG 61 FOR PIPE 10" DIA AND LARGER.
2. PIPE CLAMPS ARE NON-STANDARD AND SHALL BE FABRICATED TO SUIT THE OUTSIDE DIAMETER OF THE SPLIT SADDLE.
3. ATTACH WITH SS BANDS (FIG 9).

PIPE SIZE	2"	3"	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"
K	2"	2"	2"	3"	4"	4"	4"	5"	5"	5"	6"	6"	8"	8"
L	2"	3"	4"	6"	8"	8"	8"	10"	10"	10"	12"	12"	15"	15"
S	.125"	.125"	.125"	.125"	.125"	.140"	.140"	.140"	.140"	.140"	.188"	.188"	.188"	.188"
T	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	1/2"

FIG 106B (FOR VERTICAL RUN)

LUGS REQUIRED FOR 6"-36" PIPE		
PIPE SIZE	LUG DESCRIPTION	MATERIAL
6"-18"	6 @ 3/4"x1 1/2"x0'-3 1/4"	316 SS
20"-36"	10 @ 1"x1"x0'-2"	316 SS



NOTES:
1. ATTACH WITH SS BANDS (FIG 9).

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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 33 OF 47	
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ANSI A-8.5x11

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STANDARD DETAIL

wood.

FIG 107A (FOR HORIZONTAL RUN)

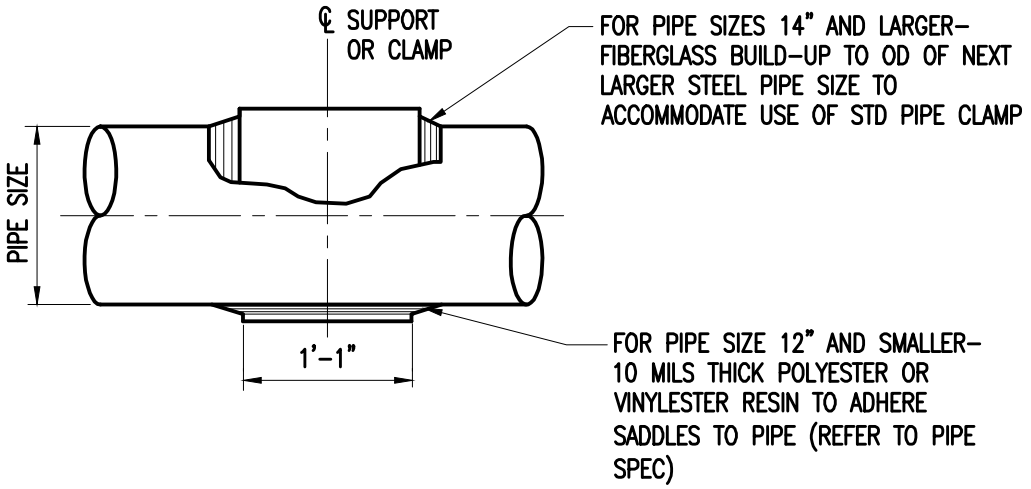
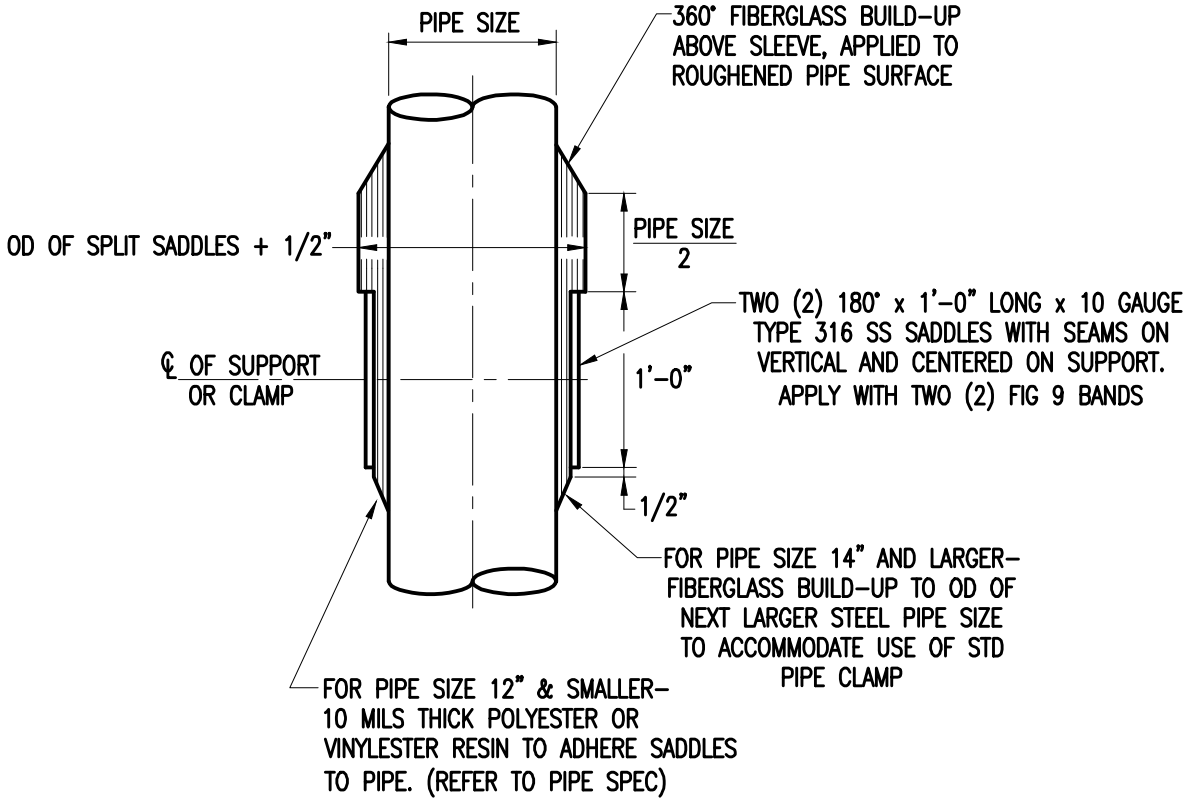


FIG 107B (FOR VERTICAL RUN)



TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 34 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–001	REV: 0		

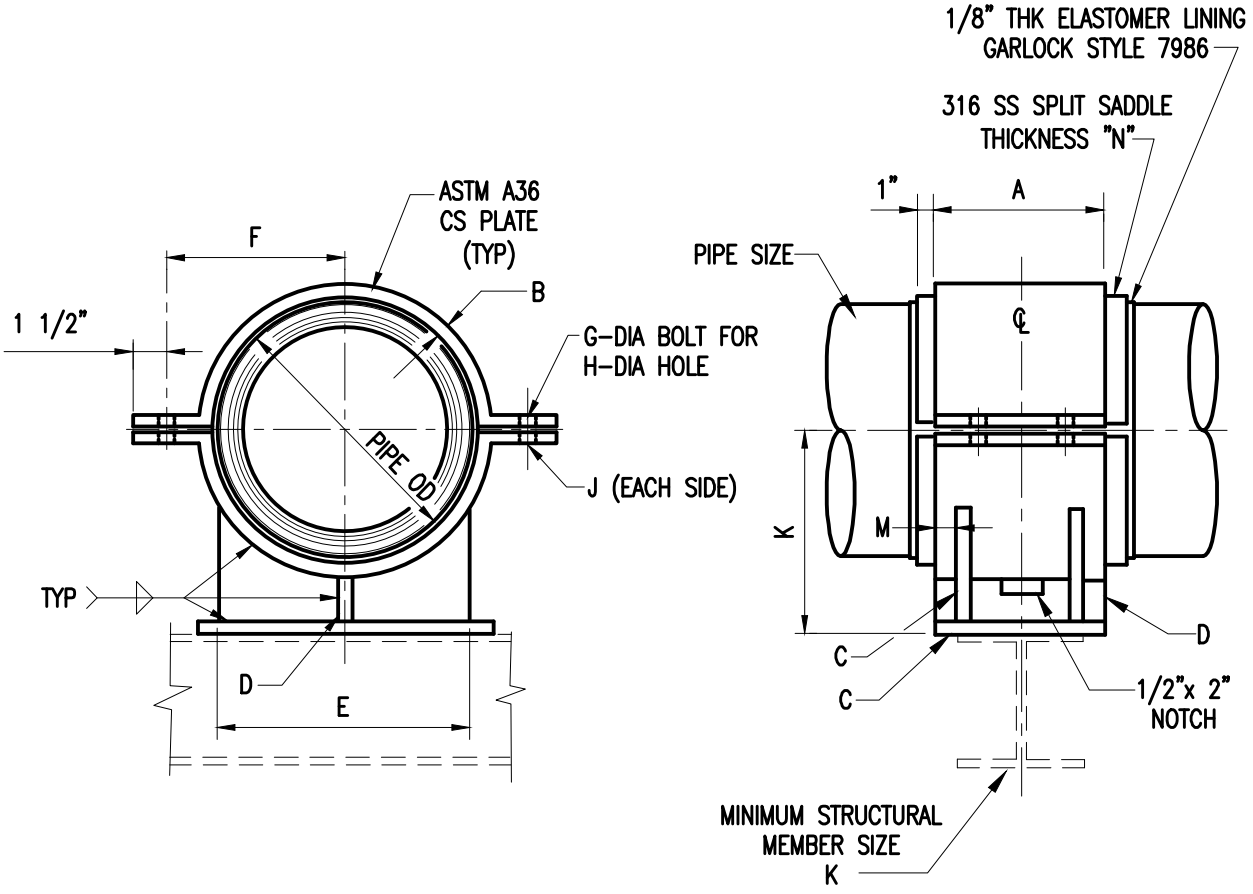
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 108



PIPE SIZE	150 PSI PIPE OD	A	PLATE THICKNESS			E	F	G	H	HOLES	K	L	M	N
			B	C	D					J				
3"	3 1/2"	6"	3/8"	3/8"	–	3 1/2"	3 1/4"	1/2"	5/8"	2	4 1/2"	W4x13	–	.125"
4'	4 1/2"	6"	3/8"	3/8"	–	4 1/2"	3 3/4"	1/2"	5/8"	2	5"	W4x13	–	.125"
6"	6 3/4"	8"	1/2"	1/2"	–	6 3/4"	5 1/4"	1/2"	5/8"	2	6"	W4x13	–	.125"
8"	8 7/8"	10"	1/2"	5/8"	–	9"	6 1/4"	1/2"	5/8"	2	7"	W6x15	–	.125"
10"	11"	12"	5/8"	3/4"	–	11"	7 3/4"	3/4"	7/8"	3	9"	W6x15	–	.140"
12"	13 1/4"	14"	3/4"	7/8"	7/8"	13 1/2"	9 1/4"	3/4"	7/8"	3	10"	W6x15	–	.140"
14"	15 1/2"	16"	3/4"	7/8"	7/8"	15 1/2"	10"	3/4"	7/8"	3	11"	W8x13	4"	.140"
16"	17 5/8"	18"	3/4"	1"	1"	17 3/4"	11"	3/4"	7/8"	3	13"	W8x13	4"	.140"
18"	19 3/4"	20"	1"	1"	1"	19 3/4"	14 1/2"	3/4"	7/8"	3	14"	W8x13	4"	.140"
20"	22"	24"	1"	1 1/8"	1"	22"	16"	3/4"	7/8"	3	16"	W8x20	6"	.188"
24"	26 1/2"	24"	1"	1 1/8"	1"	26 1/2"	18 1/2"	3/4"	7/8"	3	18"	W8x20	6"	.188"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
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PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

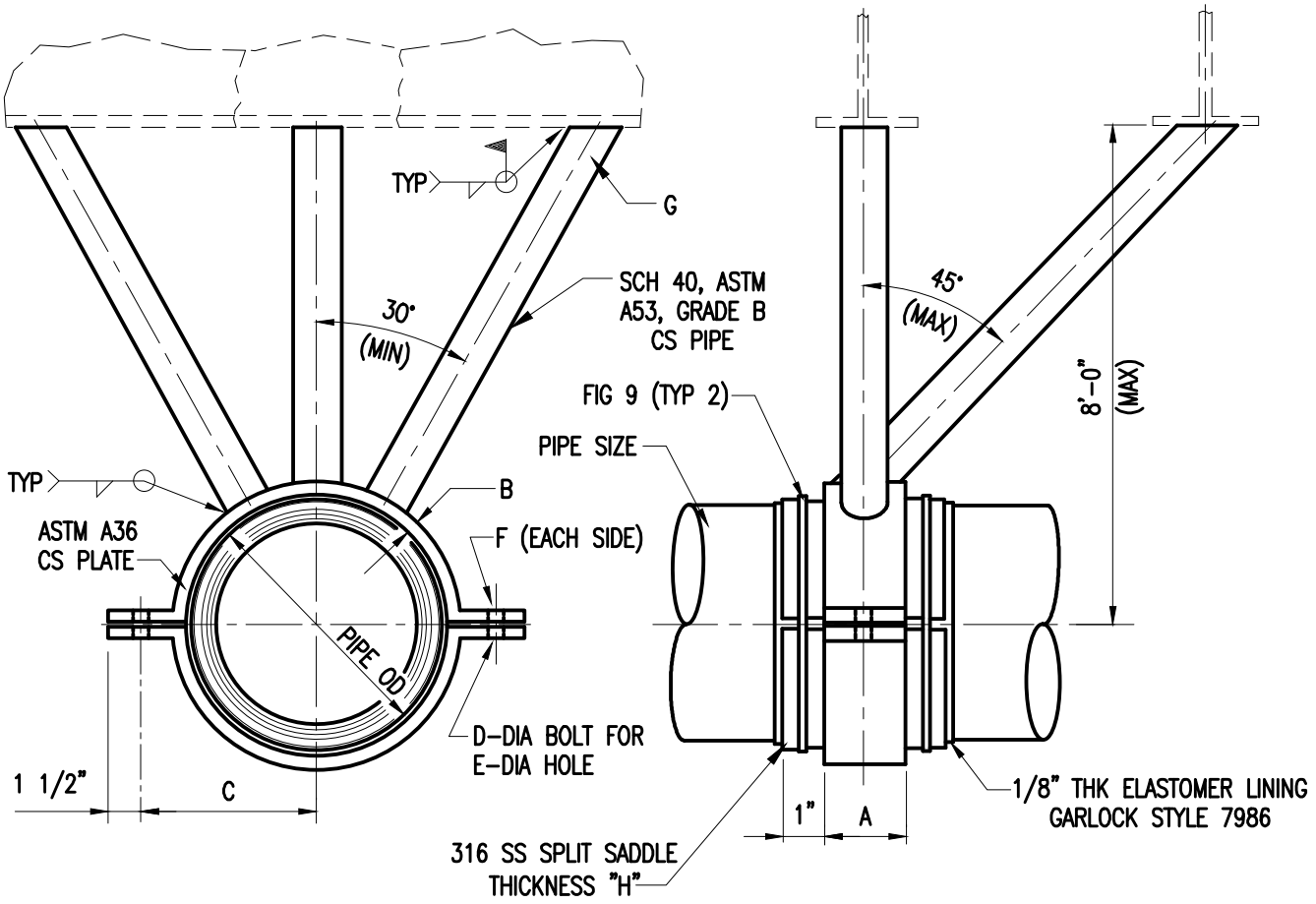
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 109



PIPE SIZE	150 PSI PIPE OD	A	B	C	D	E	HOLES F	G	H
3"	3 1/2"	2"	3/8"	3 1/4"	1/2"	5/8"	1	1"	.125"
4'	4 1/2"	3"	3/8"	3 3/4"	1/2"	5/8"	1	1"	.125"
6"	6 3/4"	3"	1/2"	5 1/4"	1/2"	5/8"	1	2"	.125"
8"	8 7/8"	4"	1/2"	6 1/4"	1/2"	5/8"	1	2"	.125"
10"	11"	4"	5/8"	7 3/4"	3/4"	7/8"	1	2"	.140"
12"	13 1/4"	6"	3/4"	9 1/4"	3/4"	7/8"	2	3"	.140"
14"	15 1/2"	6"	3/4"	10"	3/4"	7/8"	2	3"	.140"
16"	17 5/8"	6"	3/4"	11"	3/4"	7/8"	2	3"	.140"
18"	19 3/4"	9"	1"	14 1/2"	3/4"	7/8"	2	3"	.140"
20"	22"	9"	1"	16"	3/4"	7/8"	2	4"	.188"
24"	26 1/2"	9"	1"	18 1/2"	3/4"	7/8"	2	4"	.188"

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 36 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

ANSI A–8.5x11

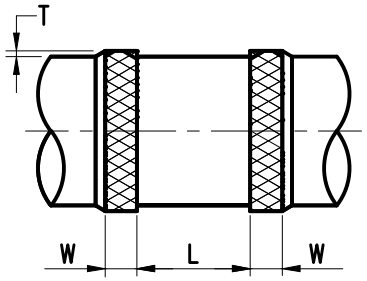
ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

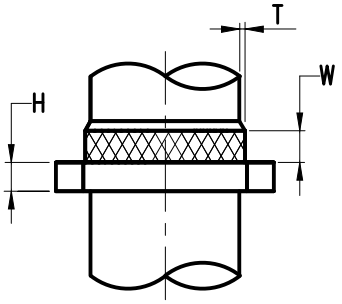
wood.

FIG 110

NOTES:
1. SEE DRAWING FOR DIMENSIONS "H" AND "L".
2. SHEAR COLLARS SHALL BE BUILT UP OF ALTERNATE LAYERS OF 1.5 OZ/FT^2 MAT AND 24 OZ/YD^2 WOVEN ROVING. REFER TO PIPE SPEC FOR RESIN TYPE.



FRP SHEAR COLLAR
USE WITH FIG
122, 123 & 124

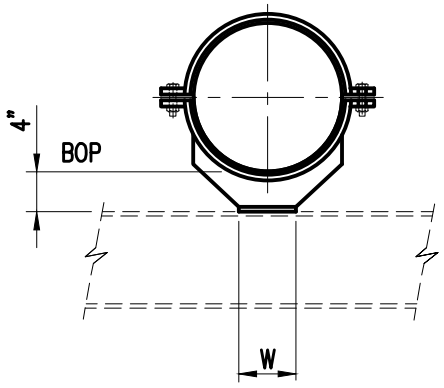


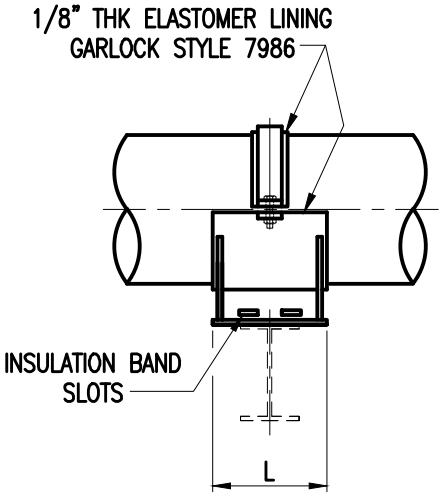
FRP SHEAR COLLAR
USE WITH FIG
116, 117 & 118

NON-METALLIC PIPE
SHEAR COLLAR
REF JOVE NO. SC OR EQUAL

PIPE SIZE	T	W
2"	1/2"	3"
3"	1/2"	3"
4"	1/2"	3"
6"	1/2"	3"
8"	1/2"	3"
10"	1/2"	3"
12"	1/2"	3"
14"	3/4"	3"
16"	3/4"	3"
18"	3/4"	4"
20"	3/4"	4"
24"	3/4"	4"
30"	1"	6"
36"	1"	6"

FIG 111





NON-METALLIC, INSULATED
PIPE SUPPORT
REF JOVE NO. FS-2R OR EQUAL

PIPE SIZE	L	W	VERT LOAD (LB)
2"	8"	4"	400
3"	8"	4"	600
4"	8"	4"	800
6"	12"	6"	1200
8"	12"	6"	1450
10"	12"	6"	1650
12"	12"	6"	2065
14"	14"	8"	3120
16"	14"	8"	3440
18"	14"	8"	4055
20"	14"	8"	4775
24"	16"	8"	6835
30"	20"	10"	8625
36"	20"	10"	11750

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
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ANSI A-8.5x11

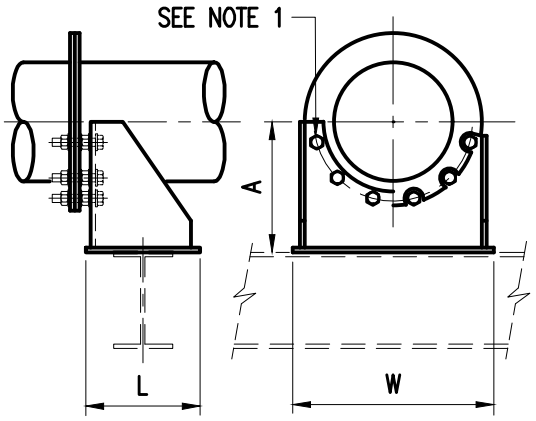
ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 112 AND 112G
(SEE NOTE 2)

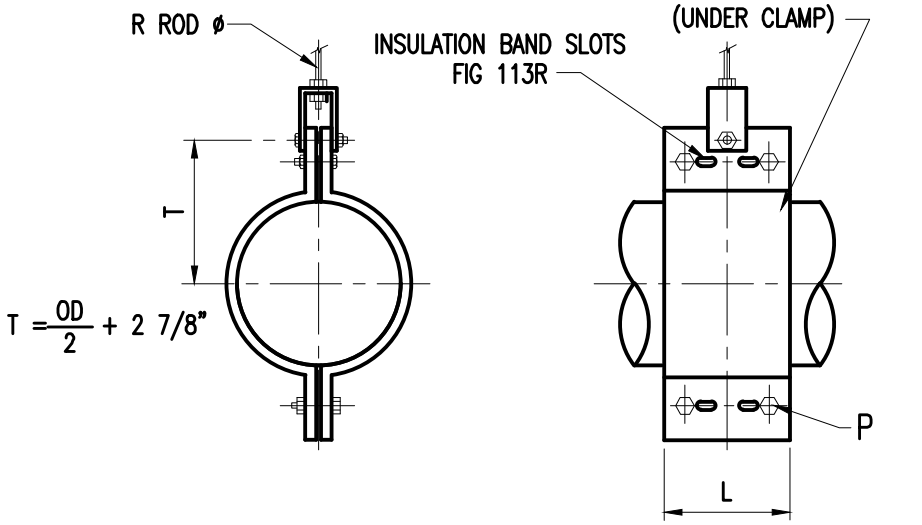


NON METALLIC PIPE
FLANGED COMPONENT SUPPORT
REF JOVE NO. FS-3

NOTES:
1. COMPONENT SUPPORTS 12" AND LARGER ARE SCALLOPED TO PROVIDE CLEARANCE FOR THE RANGE HUB REINFORCEMENT SPECIFIED IN NBS PS-15-69.
2. FOR COMPONENT SUPPORT WITH GUIDE, FIG 112G, REF JOVE NO. FS-3G.

PIPE SIZE	A	L	W	BOLT CIRCLE	NO. BOLTS	VERT LOAD (LB)	AXIAL LOAD (LB)
2"	7"	7"	9"	4-3/4"	2	400	3000
3"	7"	7"	10 1/2"	6"	2	600	3000
4"	7"	7"	12"	7 1/2"	4	800	3000
6"	14"	12"	14"	9 1/2"	4	1200	11000
8"	14"	12"	16 1/2"	11 3/4"	4	1600	11000
10"	14"	12"	19"	14 1/4"	6	2000	11000
12"	14"	12"	22"	17"	6	2550	11000
14"	20"	15"	25"	18 3/4"	6	3150	10000
16"	20"	15"	27 1/2"	21 1/4"	8	4020	10000
18"	20"	15"	29"	22 3/4"	8	5090	9000
20"	20"	15"	31"	25"	10	6360	9000
24"	20"	15"	36"	29 1/2"	10	8820	8000
30"	23"	19"	42 3/4"	36"	14	11000	15000
36"	27 3/8"	19"	50"	42 3/4"	16	14000	15000

FIG 113 AND 113R
(SEE NOTE 1)



NON-METALLIC PIPE
SUPPORT HANGER
REF JOVE NO. FS-4

PIPE SIZE	L	P	R	VERT LOAD (LB)
2"	8"	5/8"	3/8"	610
3"	8"	5/8"	3/8"	610
4"	8"	5/8"	3/8"	610
6"	8"	5/8"	3/8"	610
8"	8"	3/4"	1/2"	1130
10"	8"	3/4"	5/8"	1810
12"	12"	1"	3/4"	2710
14"	12"	1"	3/4"	2710
16"	12"	1 1/8"	7/8"	3770
18"	12"	1 1/8"	7/8"	3770
20"	14"	1 1/4"	1"	4960

NOTES:
1. FOR SUPPORT HANGER WITH INSULATION BAND SLOTS, FIG 113R, REF JOVE NO. FS-4R.

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
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PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

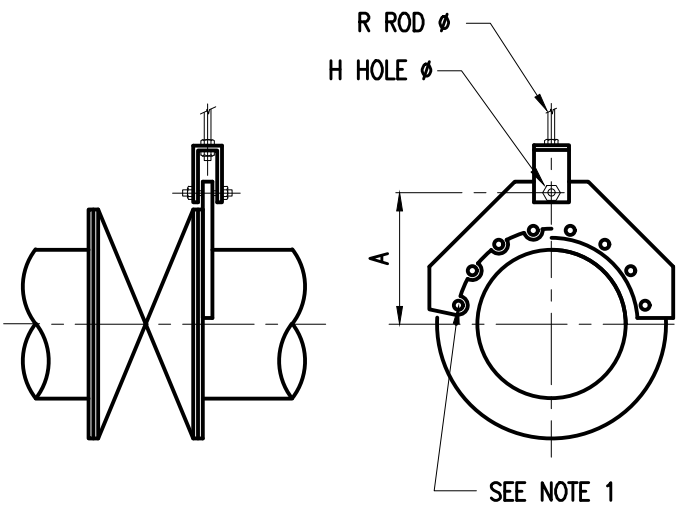
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 114

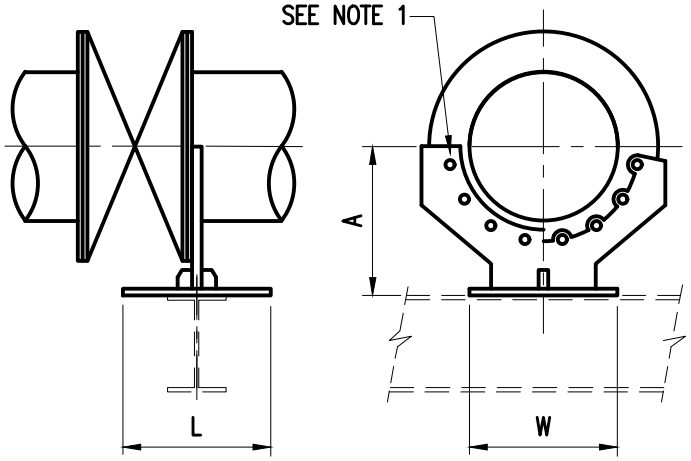


NON-METALLIC PIPE
FLANGED HANGER SUPPORT
REF JOVE NO. FS-5H OR EQUAL

NOTES:
1. COMPONENT SUPPORTS 12" AND LARGER ARE SCALLOPED TO PROVIDE CLEARANCE FOR THE RANGE HUB REINFORCEMENT SPECIFIED IN NBS PS-15-69.

PIPE SIZE	A	H	R	BOLT CIRCLE	NO. BOLTS	VERT LOAD (LB)
2"	4"	9/16"	3/8"	4-3/4"	2	610
3"	5 1/2"	9/16"	3/8"	6"	2	610
4"	6 1/4"	9/16"	3/8"	7 1/2"	4	610
6"	7 1/2"	9/16"	3/8"	9 1/2"	4	610
8"	8 7/8"	11/16"	1/2"	11 3/4"	4	1130
10"	10 1/8"	13/16"	5/8"	14 1/4"	6	1810
12"	11 3/4"	3/4"	3/4"	17"	6	2710
14"	12 7/8"	1"	3/4"	18 3/4"	6	2710
16"	14 5/8"	1 1/8"	7/8"	21 1/4"	8	3770
18"	15 3/8"	1 1/8"	7/8"	22 3/4"	8	3770
20"	16 3/4"	1 1/4"	1"	25"	10	4960
24"	19"	1 1/2"	1 1/4"	29 1/2"	10	6230
30"	22 1/2"	1 1/2"	1 1/4"	36"	14	8300
36"	25 7/8"	1 3/4"	1 1/2"	42 3/4"	16	11630

FIG 115



NON-METALLIC PIPE
COMPONENT STANCHION
REF JOVE NO. FS-5S OR EQUAL

NOTES:
1. COMPONENT SUPPORTS 12" AND LARGER ARE SCALLOPED TO PROVIDE CLEARANCE FOR THE RANGE HUB REINFORCEMENT SPECIFIED IN NBS PS-15-69.

PIPE SIZE	A	L & W	BOLT CIRCLE	NO. BOLTS	VERT LOAD (LB)
2"	7 1/2"	8"	4-3/4"	2	400
3"	7 1/2"	8"	6"	2	400
4"	7 1/2'"	8"	7 1/2"	4	400
6"	14 1/2"	10"	9 1/2"	4	600
8"	14 1/2"	10"	11 3/4"	4	1400
10"	14 1/2"	10"	14 1/4"	6	1600
12"	14 1/2"	12"	17"	6	2000
14"	20 5/8"	12"	18 3/4"	6	3000
16"	20 5/8"	15"	21 1/4"	8	3300
18"	20 5/8"	15"	22 3/4"	8	3900
20"	20 5/8"	15"	25"	10	4600
24"	20 5/8"	15"	29 1/2"	10	6600
30"	23"	15"	36"	14	8300
36"	27 3/8"	15"	42 3/4"	16	11630

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
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PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

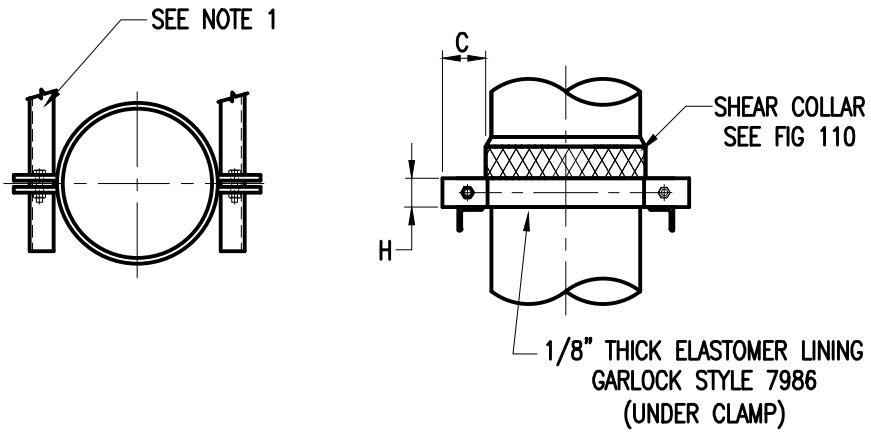
ANSI A-8.5x11

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STANDARD DETAIL

wood.

FIG 116

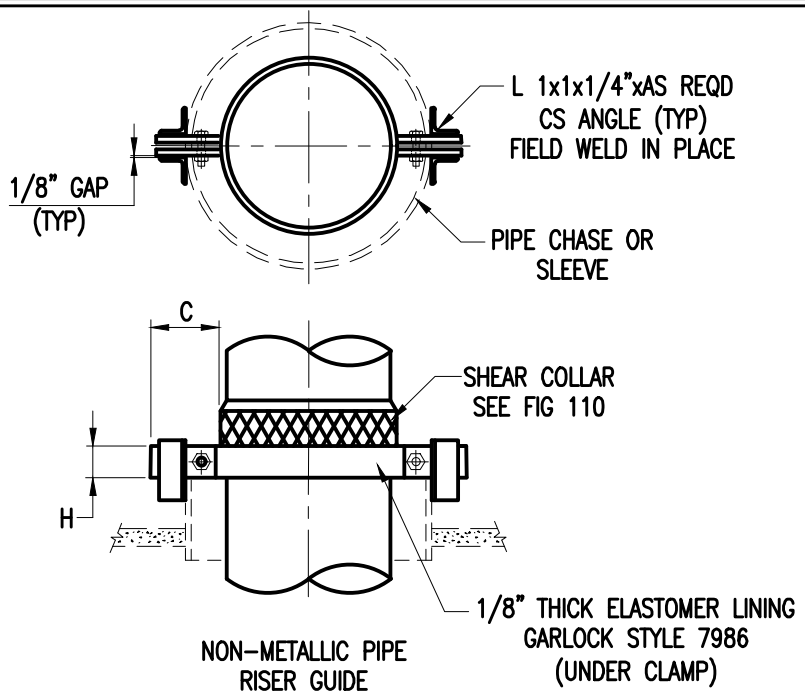


NON-METALLIC PIPE
RISER SUPPORT
REF JOVE NO. FS-6 OR EQUAL

NOTES:
1. SEE DRAWING FOR SUPPLEMENTAL STEEL (FIG 103).

PIPE SIZE	C	H	VERT LOAD (LB)
2"	4"	2"	400
3"	4"	2"	400
4"	4"	3"	400
6"	4"	3"	600
8"	4"	3"	1400
10"	4"	3"	2800
12"	4"	3"	3100
14"	4"	4"	3200
16"	4"	5"	3800
18"	4"	6"	4300
20"	4"	6"	4300
24"	4"	6"	6500
30"	4"	6"	8700
36"	4"	8"	14900

FIG 117



NON-METALLIC PIPE
RISER GUIDE
REF JOVE NO. FS-6G OR EQUAL

NOTES:
1. SEE DRAWING FOR DIMENSION "C".
2. REVIEW INDUCED LOADING WITH STRUCTURAL DEPARTMENT.

PIPE SIZE	H	VERT LOAD (LB)
2"	3"	400
3"	3"	400
4"	3"	400
6"	3"	600
8"	3"	600
10"	3"	600
12"	3"	600
14"	3"	1200
16"	3"	1200
18"	4"	1600
20"	4"	1500
24"	4"	1500
30"	6"	2100
36"	6"	1900

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
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PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

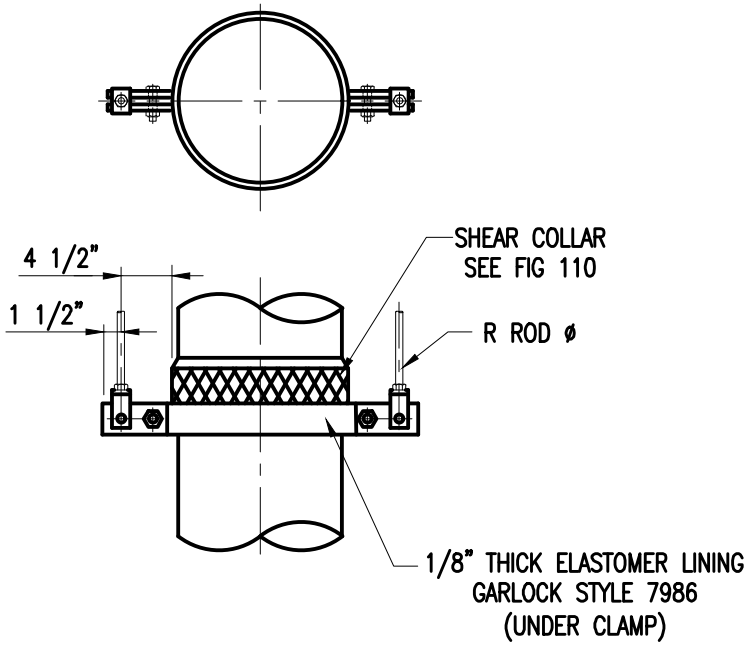
ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

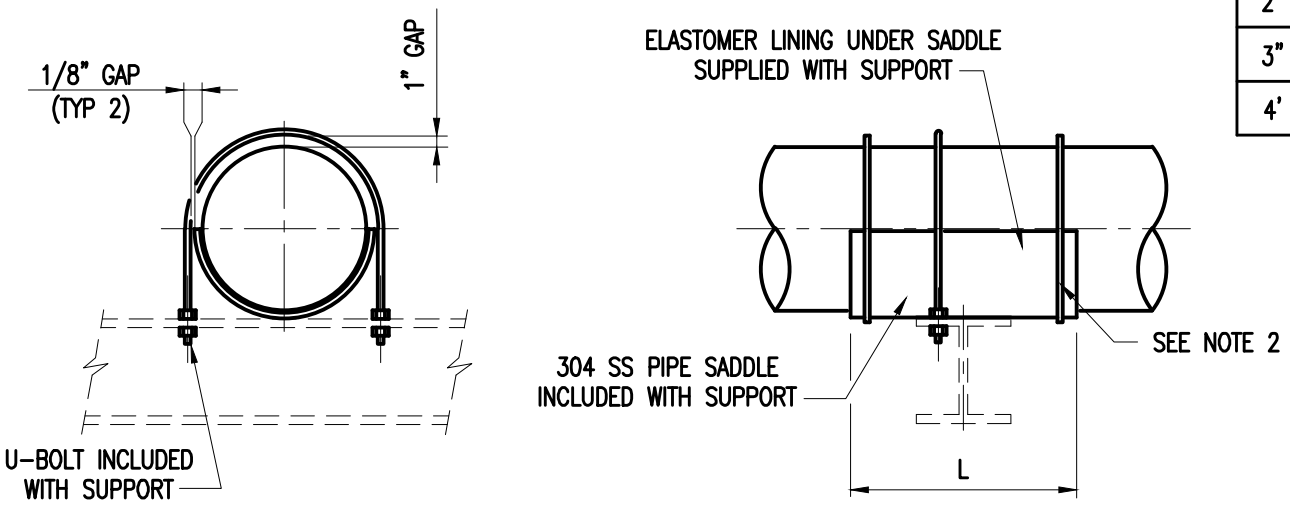
FIG 118



NON-METALLIC PIPE
RISER HANGER
REF JOVE NO. FS-6H OR EQUAL

PIPE SIZE	H	R	VERT LOAD (LB)
2"	3"	3/8"	400
3"	3"	3/8"	400
4"	3"	1/2"	400
6"	3"	5/8"	600
8"	3"	5/8"	1400
10"	4"	3/4"	1800
12"	5"	3/4"	2300
14"	6"	7/8"	2600
16"	6"	7/8"	4500
18"	6"	7/8"	4500
20"	6"	1"	4500
24"	6"	1 1/4"	8600
30"	6"	1 1/2"	8000
36"	6"	2"	10000

FIG 119



NON-METALLIC PIPE
GUIDE SADDLE
REF JOVE NO. FS-7 OR EQUAL

PIPE SIZE	L
2"	12"
3"	12"
4'	12"

NOTES:
1. DO NOT USE FOR PIPE LARGER THAN 4".
2. INSTALL SADDLE WITH SS BANDS (FIG 9).

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
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PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

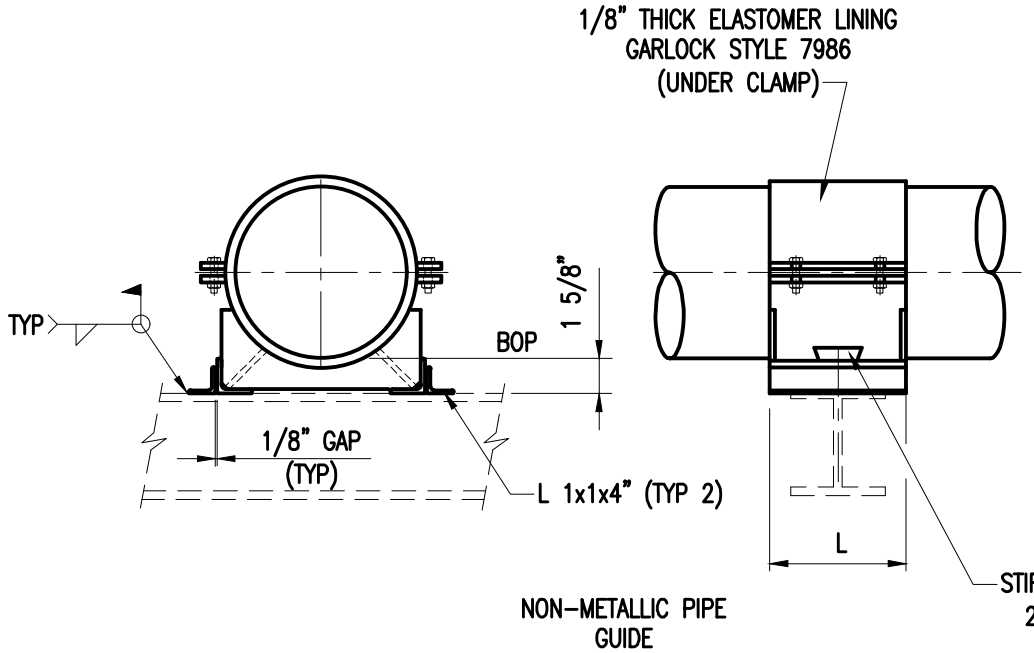
ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.

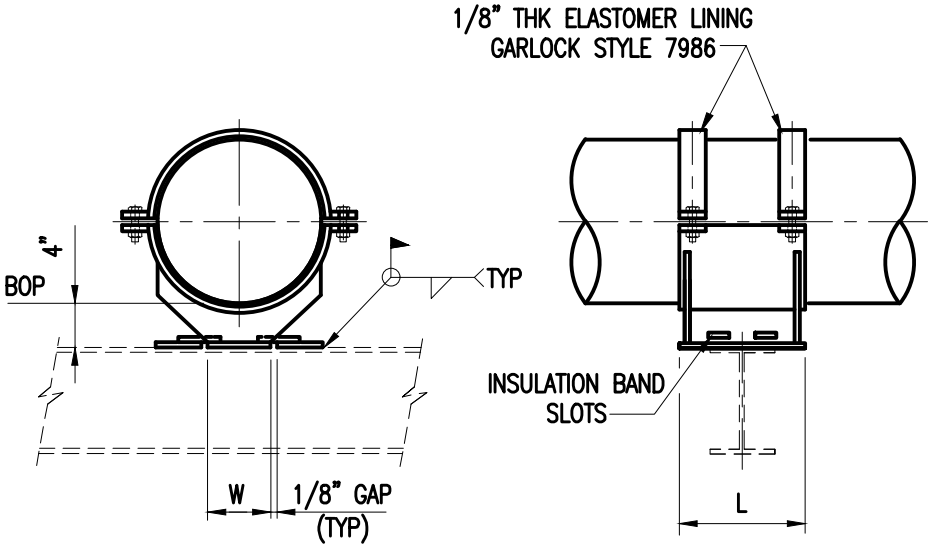
FIG 120



NON-METALLIC PIPE
GUIDE
REF JOVE NO. FS-8 OR EQUAL

PIPE SIZE	L	VERT LOAD (LB)
6"	12"	1200
8"	12"	1600
10"	12"	2000
12"	12"	2400
14"	14"	3075
16"	14	3385
18"	14"	4000
20"	14"	4710
24"	16"	6750
30"	20	8525
36"	20"	11550

FIG 121



NON-METALLIC, INSULATED
PIPE GUIDE WITH TWO STRAPS
REF JOVE NO. FS-8R OR EQUAL

PIPE SIZE	L	W	VERT LOAD (LB)
2"	8"	4"	400
3"	8"	4"	600
4"	8"	4"	800
6"	12"	6"	1200
8"	12"	6"	1450
10"	12"	6"	1650
12"	12"	6"	2065
14"	14"	8"	3120
16"	14"	8"	3440
18"	14"	8"	4055
20"	14"	8"	4775
24"	16"	8"	6835
30"	20"	10"	8625
36"	20"	10"	11750

TITLE:	DETAIL TITLE				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 42 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

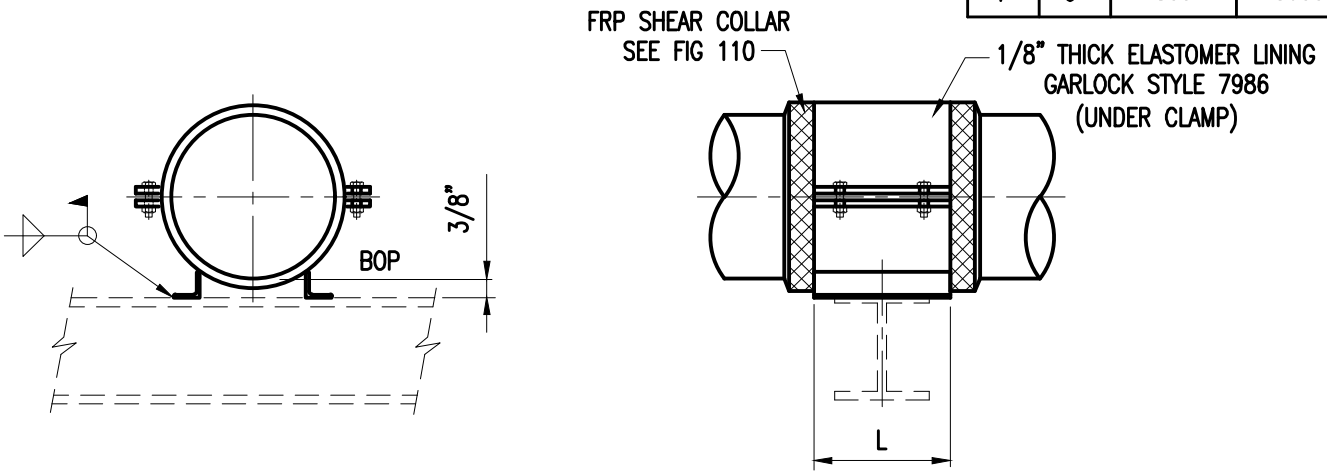
ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 122

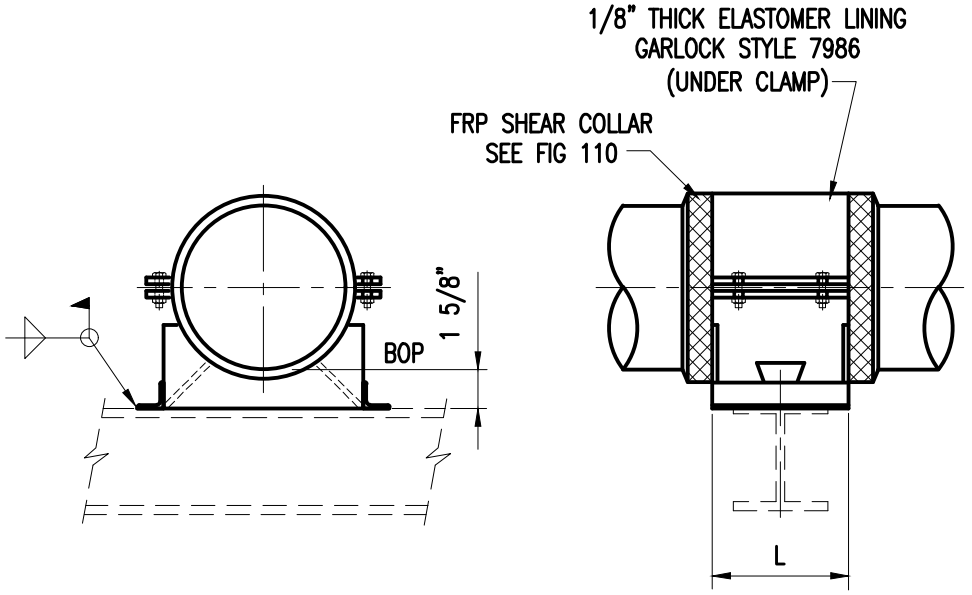
PIPE SIZE	L	VERT LOAD (LB)	AXIAL LOAD (LB)
2"	6"	400	1500
3"	6"	600	2200
4"	6"	800	3000



NON-METALLIC PIPE
LIGHT DUTY ANCHOR
REF JOVE NO. FS-9 OR EQUAL

FIG 123

PIPE SIZE	L	VERT LOAD (LB)	AXIAL LOAD (LB)
6"	12"	1200	4000
8"	12"	1600	7000
10"	12"	2000	10200
12"	12"	2400	14600
14"	14"	3125	20000
16"	14"	3440	26000
18"	14"	4060	28000
20"	14"	4780	30000
24"	16"	6345	40000
30"	20"	8660	50000
36"	20"	11600	60000



NON-METALLIC PIPE
HEAVY DUTY ANCHOR
REF JOVE NO. FS-10 OR EQUAL

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 43 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

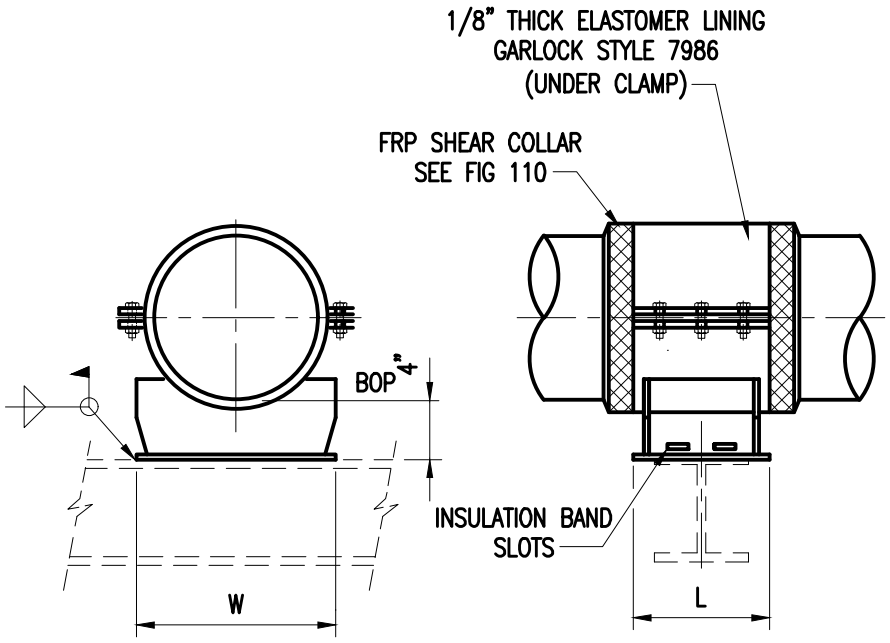
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

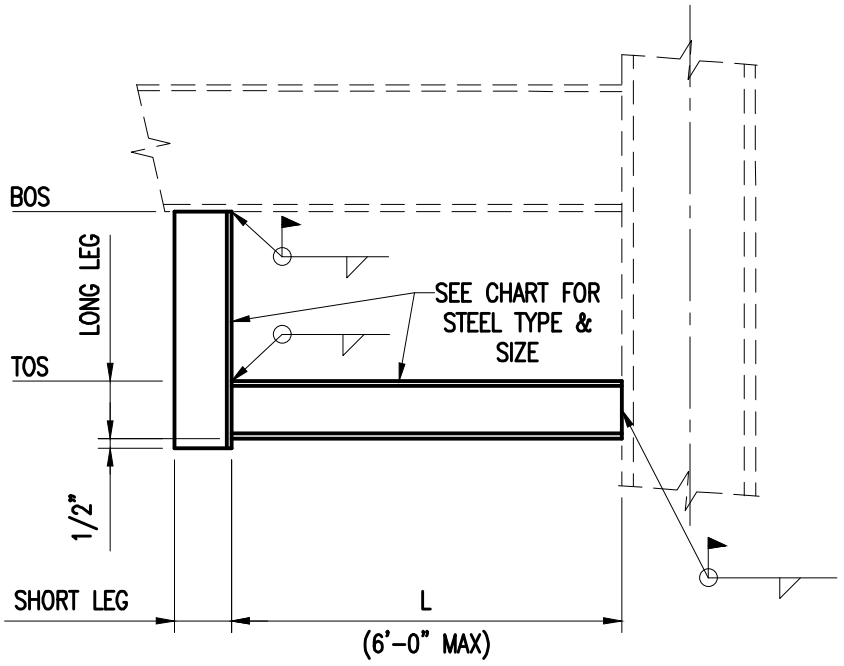
FIG 124



NON-METALLIC, INSULATED
PIPE ANCHOR WITH FULL CAP
REF JOVE NO. FS-10R OR EQUAL

PIPE SIZE	L	W	VERT LOAD (LB)	AXIAL LOAD (LB)
2"	12"	4"	400	550
3"	12"	4"	400	1130
4"	12"	4"	400	1810
6"	12"	6"	600	4000
8"	12"	6"	1450	6700
10"	12"	6"	1650	10200
12"	12"	6"	2065	14600
14"	14"	8"	3120	20000
16"	14"	8"	3440	26000
18"	14"	8"	4055	28000
20"	16"	8"	4775	30000
24"	20"	10"	6850	40000
30"	20"	10"	8660	50000
36"	20"	10"	11600	60000

FIG 125 (A-D)



TYPE	STEEL MEMBER	
	HORIZONTAL	VERTICAL
A	L3x3x3/8"	L3x3x3/8"
B	L4x3x3/8"	L4x3x3/8"
C	W6x15	WT4x15.5
D	W8x18	WT4x15.5

NOTES:
1. SEE DRAWING FOR "L" AND TOS.
2. SUPPORT CAN BE INVERTED ABOVE EXISTING BEAM.
3. SEE FIG 103 FOR ALLOWABLE LOADS ON HORIZONTAL MEMBER.

TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 44 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

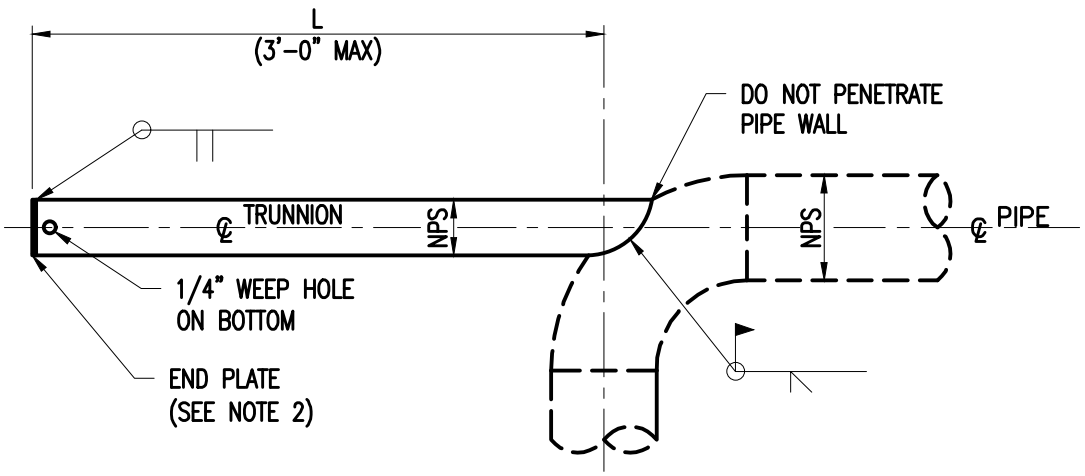
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

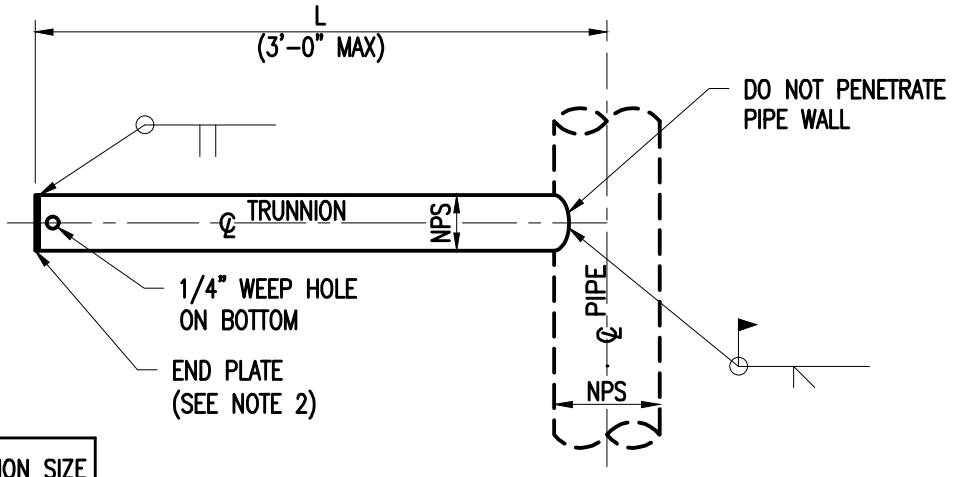
STANDARD DETAIL

wood.

FIG 126



CARBON OR LOW
ALLOY STEEL
ELBOW SUPPORT



CARBON OR LOW
ALLOY STEEL
PIPE SUPPORT

PIPE SIZE NPS	TRUNION SIZE NPS
3"	2"
4"	2"
6"	3"
8"	4"
10"	6"
12"	6"
14"	10"
16"	10"

NOTES:

1. TRUNNION TO BE SAME MATERIAL AND WALL THICKNESS AS PRESSURE PIPE.
2. END PLATE TO BE SAME OD AND MATERIAL AS TRUNNION.
3. CALCULATION REQUIRED FOR USE.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 45 OF 47	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001	REV: 0		

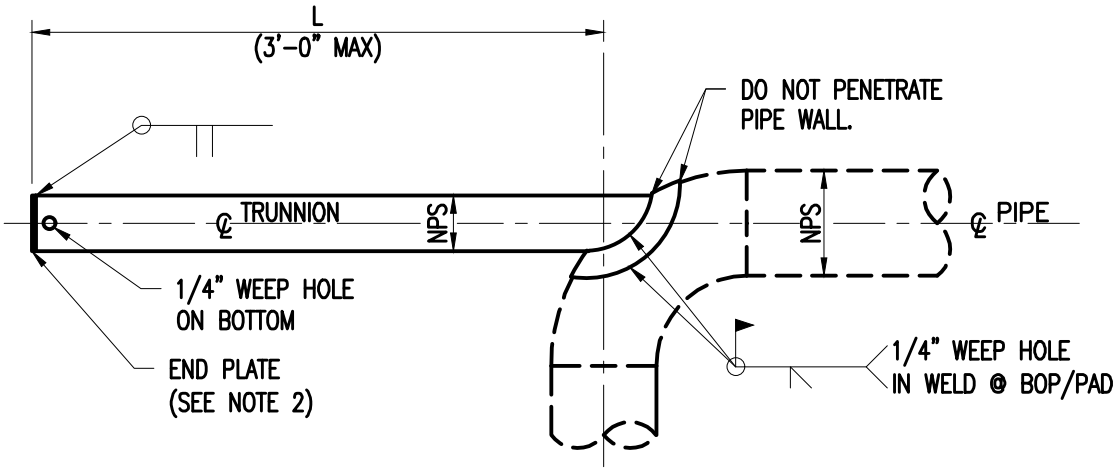
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

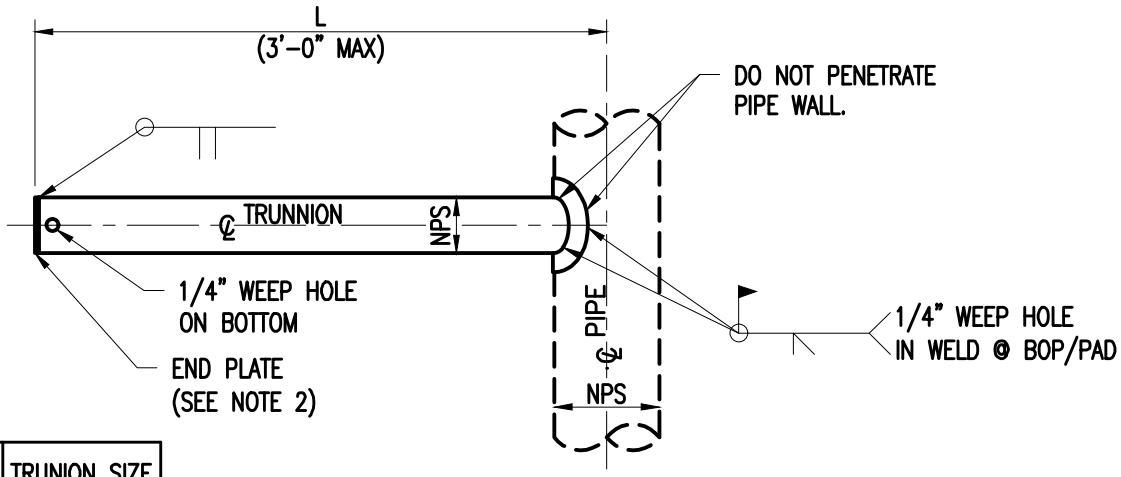
STANDARD DETAIL

wood.

FIG 127



STAINLESS STEEL
ELBOW SUPPORT



STAINLESS STEEL
PIPE SUPPORT

PIPE SIZE NPS	TRUNION SIZE NPS
3"	2"
4"	2"
6"	3"
8"	4"
10"	6"
12"	6"
14"	10"
16"	10"

NOTES:
1. TRUNNION TO BE SCH 40 CS PIPE.
2. END PLATE TO BE SAME O.D. AND MATERIAL AS TRUNNION.
3. POISON PAD TO BE THE SAME MATERIAL AND THICKNESS AS PRESSURE PIPE. PAD SIZE TO BE (2) TIMES THE NPS OF THE TRUNNION AND CURVED TO FIT PIPE.
4. CALCULATION REQUIRED FOR USE.

TITLE:	PIPE SUPPORT DETAIL – FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 46 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

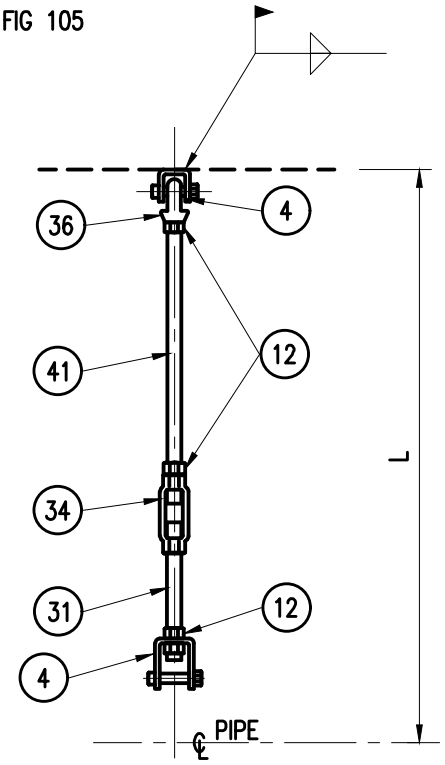
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.

FIG 105



MINIMUM DISTANCE TABLE		
PIPE SIZE	L	ROD SIZE
3"	2'-2"	3/8"
4"	2'-4"	
6"	2'-5"	
8"	2'-9"	1/2"
10"	2'-11"	5/8"
12"	3'-0"	3/4"
14"	3'-1"	
16"	3'-2"	7/8"
18"	3'-6"	
20"	3'-10"	1"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
41	CONTINUOUS THREADED ROD, NO. 146

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES:

1. USE WITH FIG 113, 113R, 114 & 118.

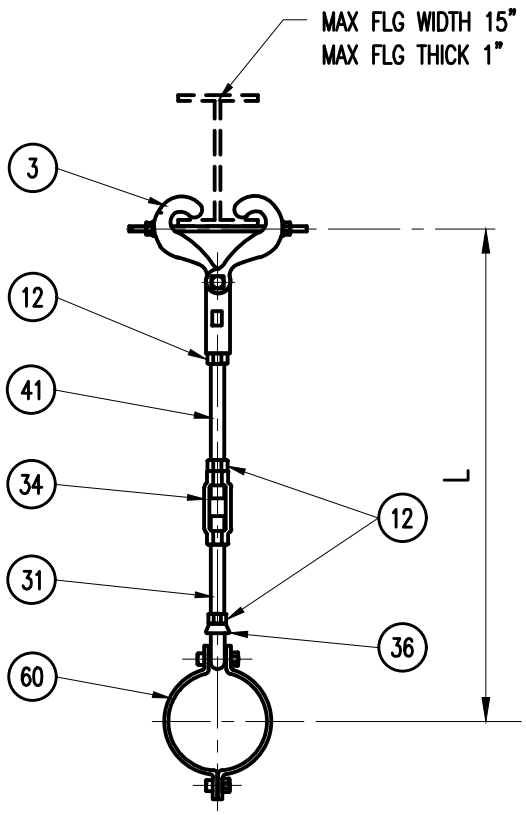
TITLE:	PIPE SUPPORT DETAIL - FIGURE NUMBERS				
DATE:	15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 47 OF 47
PROJ NO.:	GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-001		REV: 0

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1040	2'-2"
4"	1040	2'-4"
6"	1615	2'-5"
8"	1615	2'-9"

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
60	SINGLE BOLT PIPE CLAMP, NO. 212

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. NOT TO BE USED FOR LOADS SHOWN IN AMEC SUPPORT SPANS SPEC SS-039-004.
3. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HA01

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA01	REV: 0		

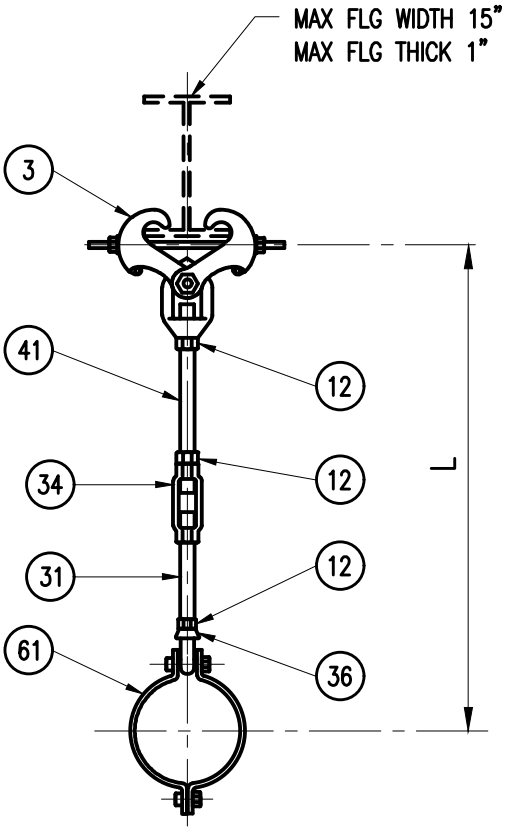
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2-2"
4"	2-3"
6"	2-4"
8"	2-9"
10"	2-11"
12"	3-0"
14"	3-2"
16"	3-3"
18"	3-7"
20"	3-9"

HA02

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R & L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. NOT TO BE USED WITH AMEC PIPE SUPPORT SPANS SPEC SS-039-004 FOR SIZES LARGER THAN 20" DIA.
2. SUPPORT DETAIL LIMITED BY BEAM CLAMP TO 11,500 LB MAX.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

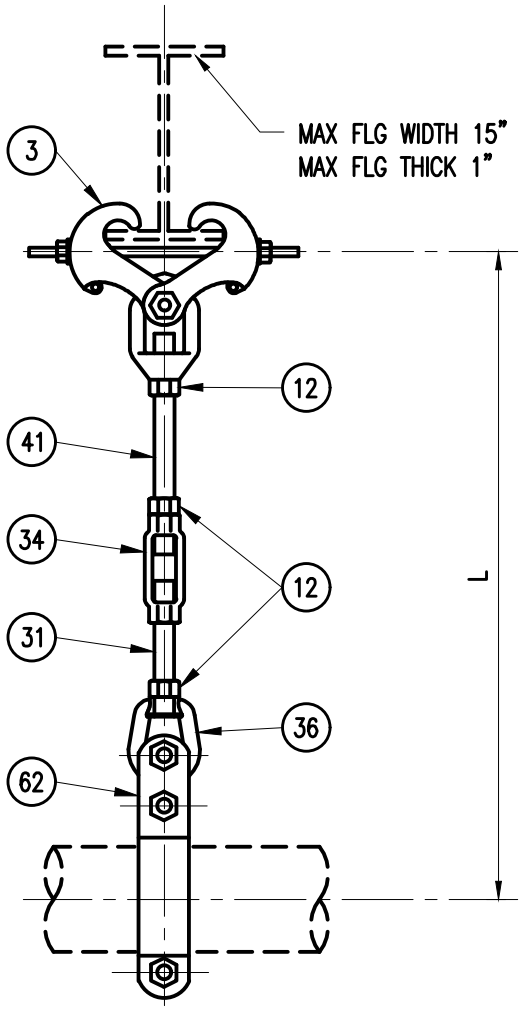
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA02	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-5"
4"	2'-7"

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R & L), NO.253
34	FS TURNBUCKLE, NO. 230
36	RIGHT HAND THREADED WELDLESS EYE NUT ANVIL
	NO. 290 OR EQUAL
41	CONTINUOUS THREADED ROD NO.146
62	DOUBLE BOLT PIPE CLAMP, NO. 295

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 4" DIA.

HA03

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

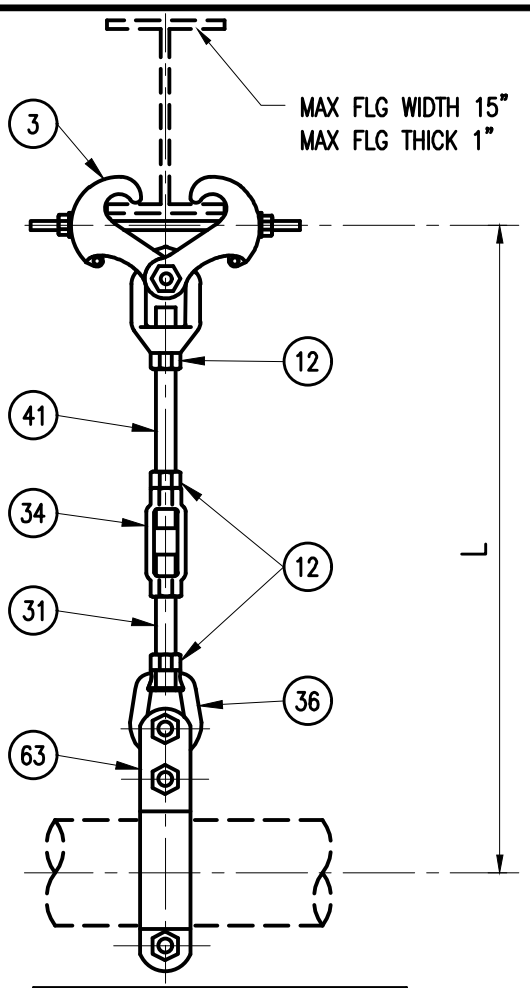
TITLE:	PIPE SUPPORT DETAIL – TYPE HA03				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA03	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
6"	2'-8"
8"	3'-1"
10"	3'-2"
12"	3'-3"
14"	3'-6"
16"	3'-7"
18"	3'-9"
20"	3'-10"
24"	4'-5"
30"	5'-6"

HA04

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R & L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
63	HEAVY DUTY DOUBLE BOLT PIPE CLAMP, NO. 295H

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE SMALLER THAN 6" OR LARGER THAN 30" DIA.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HA04				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA04	REV: 0		

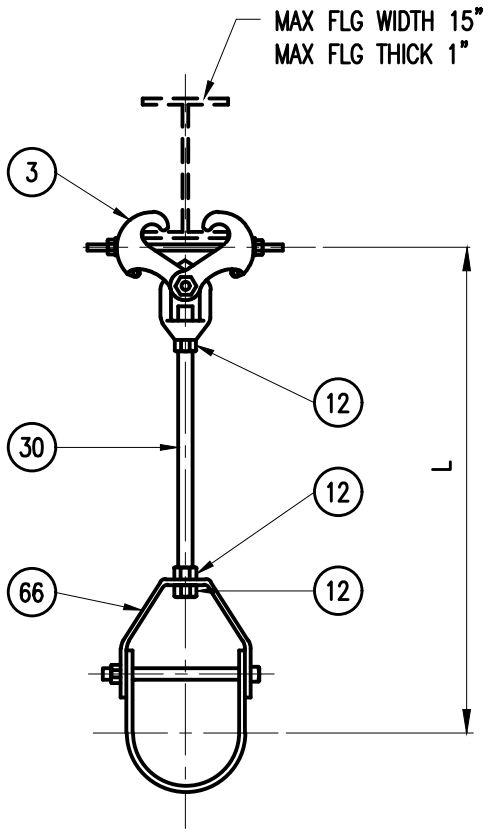
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	L MIN	MAX LOAD (LB)	MAX SPAN
3"	1'-2"	1350	12'-0"
4"	1'-3"	1430	14'-0"
6"	1'-5"	1940	17'-0"
8"	1'-7"	2000	19'-0"

HA05

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT, NO. 194
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS, NO. 260

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. NOT TO BE USED WITH SUPPORT SPANS SPEC SS-039-004.
3. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LISTED.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

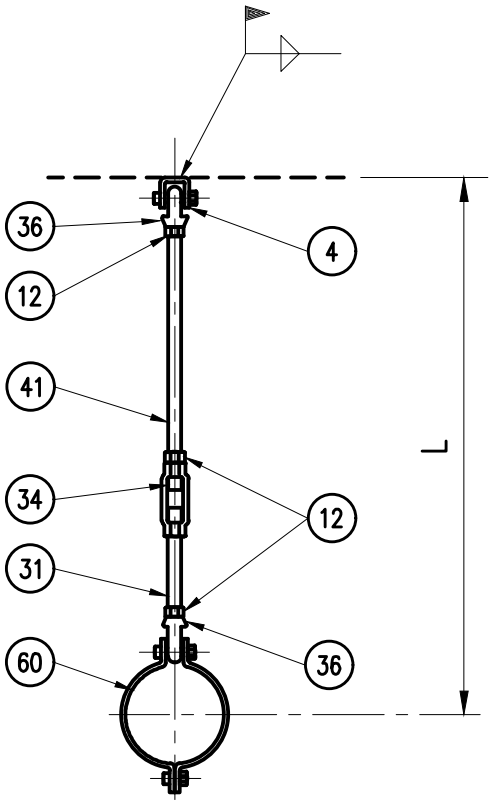
TITLE:	PIPE SUPPORT DETAIL – TYPE HA05				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA05	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	MAX LOAD (LB)	L
3"	1040	2'-2"
4"	1040	2'-4"
6"	1615	2'-5"
8"	1615	2'-9"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L) NO. 253
34	F.S. TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO.146
60	SINGLE BOLT PIPE CLAMP, NO. 212

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. NOT TO BE USED FOR LOADS SHOWN IN PIPE SPANS SPEC SS-030-004.
3. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HA10

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

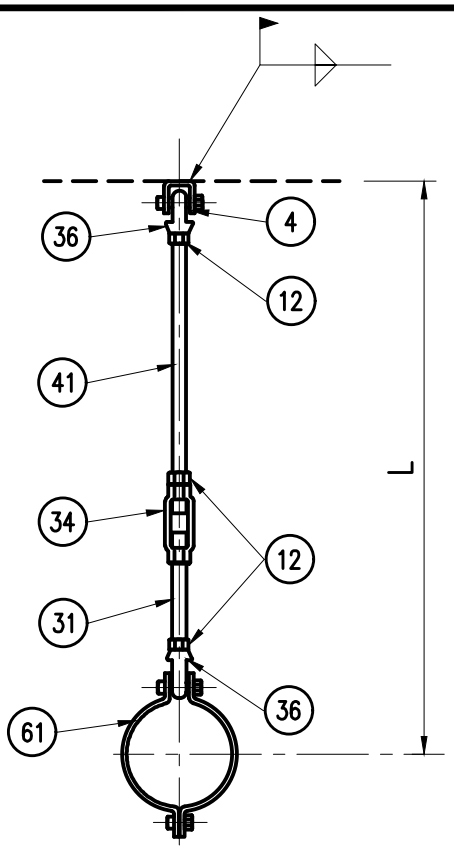
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA10	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-2"
4"	2'-4"
6"	2'-5"
8"	2'-9"
10"	2'-11"
12"	3'-0"
14"	3'-1"
16"	3'-2"
18"	3'-6"
20"	3'-10"
24"	4'-2"
30"	5'-3"
36"	5'-9"

HA11

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDNESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

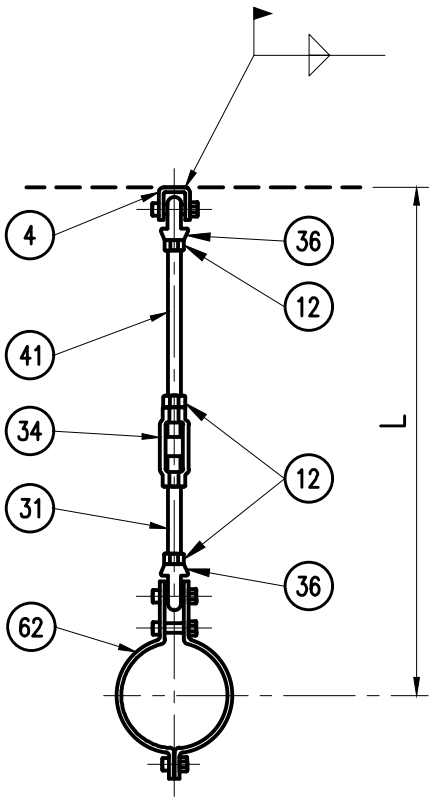
TITLE:	PIPE SUPPORT DETAIL – TYPE HA11				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA11	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-5"
4"	2'-7"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD, NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
62	DOUBLE BOLT PIPE CLAMP, NO. 295

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 4" DIA.

HA12

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

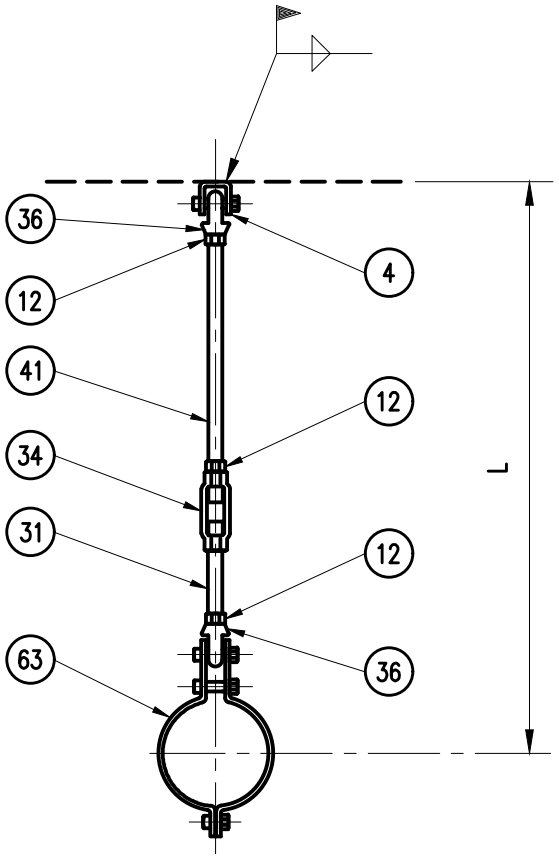
TITLE:	PIPE SUPPORT DETAIL – TYPE HA12				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA12	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
6"	2'-9"
8"	2'-10"
10"	2'-11"
12"	3'-0"
14"	3'-3"
16"	3'-4"
18"	3'-5"
20"	3'-8"
24"	4'-3"
30"	5'-7"
36"	6'-6"

HA14

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT, NO. 194
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD, NO. 146
63	HEAVY DUTY DOUBLE BOLT PIPE CLAMP, NO. 295H

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE SMALLER THAN 6" DIA.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

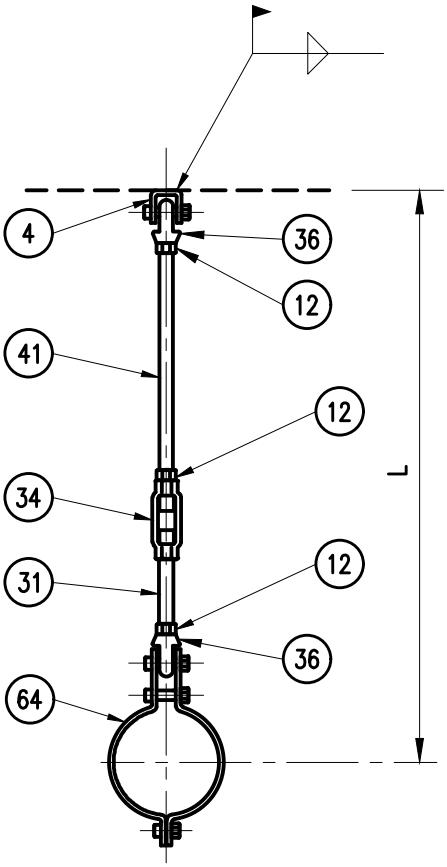
TITLE:	PIPE SUPPORT DETAIL – TYPE HA14				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA14	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-3"
4"	2'-4"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD, NO. 146
64	ALLOY STEEL DOUBLE BOLT PIPE CLAMP, NO. 295A

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 4" DIA.
2. SEE STANDARD TD-039-004, PIPE SUPPORT SPANS, NOTE 4.

HA15

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA15				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA15	REV: 0		

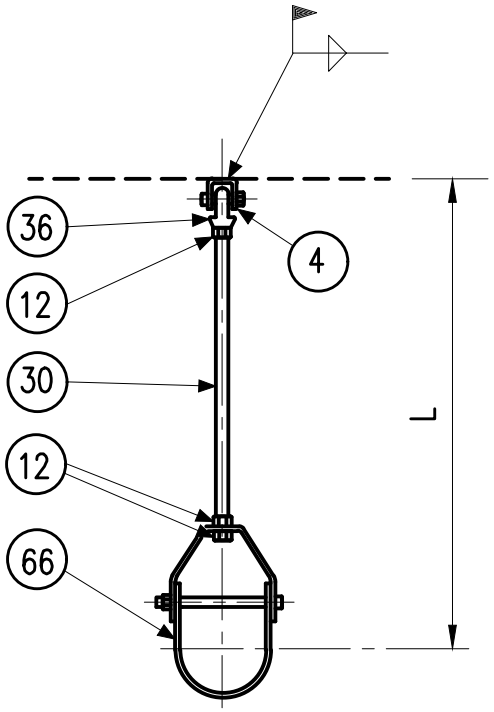
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
66	ADJUSTABLE CLEVIS, NO. 260

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

PIPE SIZE	MAX LOAD (LB)	L
3"	1350	1'-1"
4"	1430	1'-2"
6"	1940	1'-3"

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 6" DIA.
2. NOT TO BE USED FOR LOADS SHOWN IN PIPE SPANS SPEC SS-030-004.
3. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HA16

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA16				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C, FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA16	REV: 0		

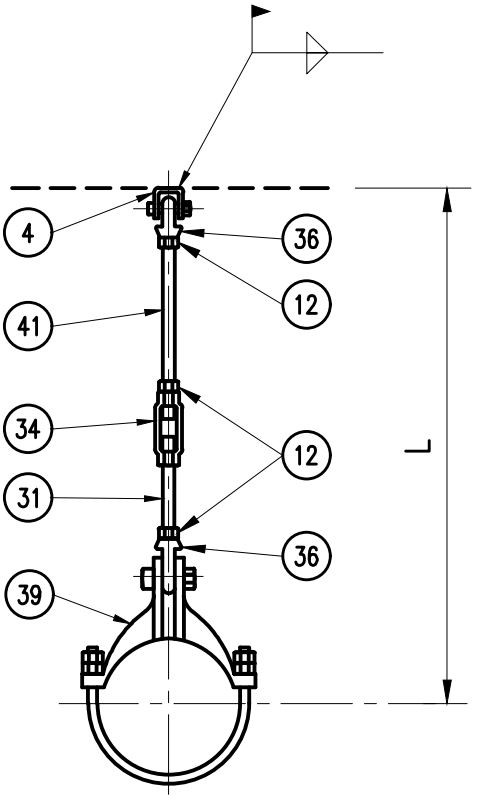
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
4"	2'-7"
6"	2'-8"
8"	3'-0"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
39	ALLOY STEEL PIPE CLAMP, NO. 224
41	CONTINUOUS THREADED ROD NO.146

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE STANDARD TD-039-004, PIPE SUPPORT SPANS, NOTE 4.

HA17

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA17				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA17	REV: 0		

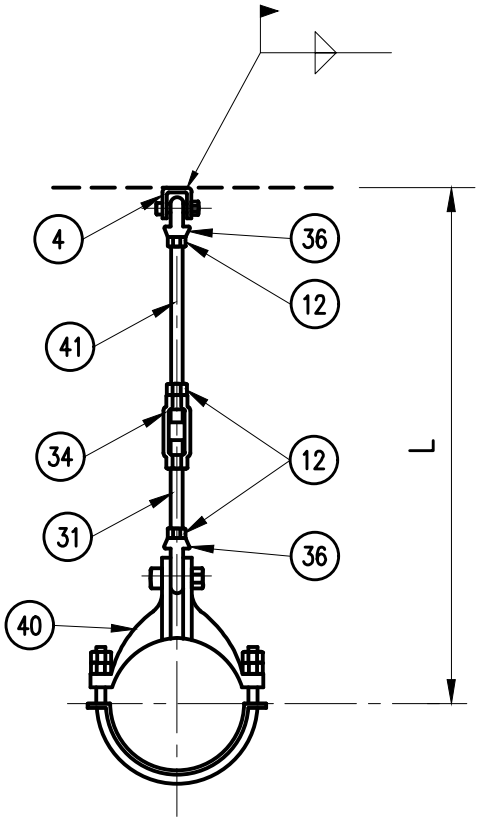
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
10"	3'-0"
12"	3'-2"
14"	3'-3"
16"	3'-4"
18"	3'-6"
20"	3'-10"
24"	4'-2"

HA18

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
40	HEAVY DUTY ALLOY STEEL PIPE CLAMP, NO. 246
41	CONTINUOUS THREADED ROD NO. 146

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE STANDARD TD-039-004, PIPE SUPPORT SPANS, NOTE 4.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA18				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA18	REV: 0		

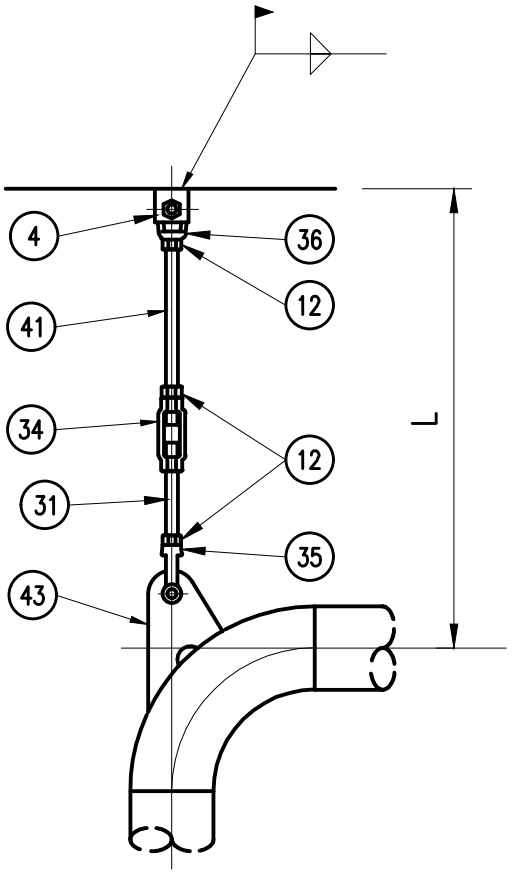
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-7"
4"	2'-9"
6"	2'-10"
8"	3'-2"
10"	3'-2"
12"	3'-2"
14"	3'-3"
16"	3'-4"
18"	3'-4"
20"	3'-5"
24"	3'-8"
30"	4'-1"

HA19

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THEADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
35	FS CLEVIS, NO. 299
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
43	WELDING LUG

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

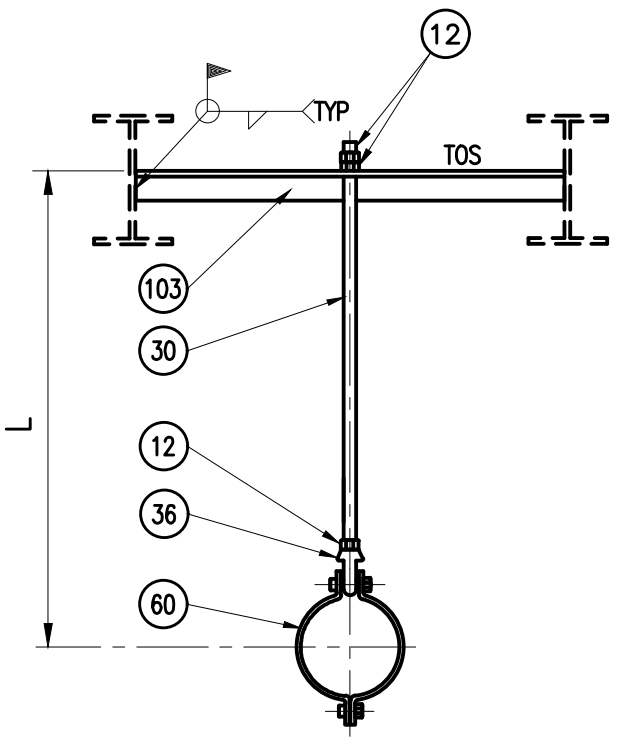
TITLE:	PIPE SUPPORT DETAIL – TYPE HA19				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA19	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	MAX LOAD (LB)	L
3"	1040	7"
4"	1040	7"
6"	1615	9"
8"	1615	11"

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. SEE DRAWING FOR FIG 103 AND TOS.
3. NOT TO BE USED FOR LOADS SHOWN IN SUPPORT SPANS SPEC SS-039-004.
4. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAX LOADS LISTED.

HA30

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

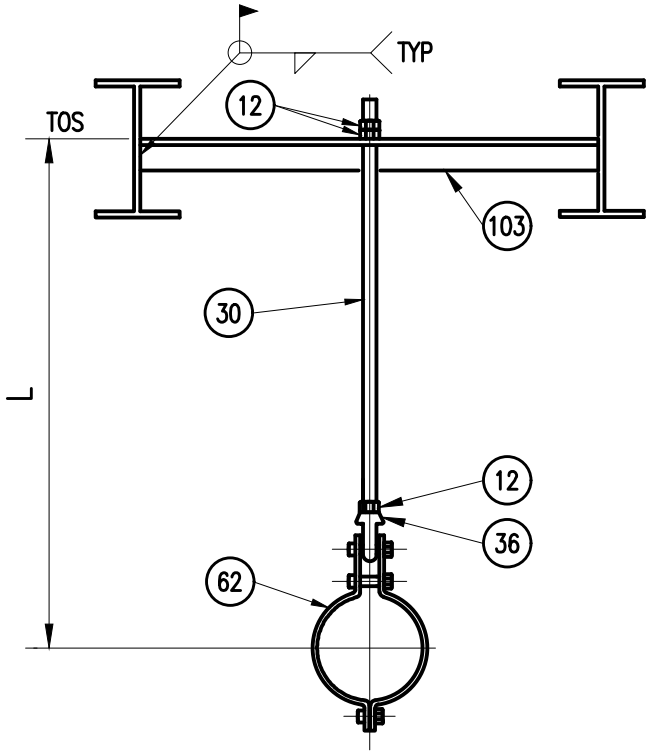
TITLE:	PIPE SUPPORT DETAIL – TYPE HA30				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA30	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	10"
4"	11"

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYENUT, NO. 290
62	DOUBLE BOLT PIPE CLAMP, NO. 295
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 4" DIA.
2. SEE DRAWING FOR TOS AND FIG 103.

HA31

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

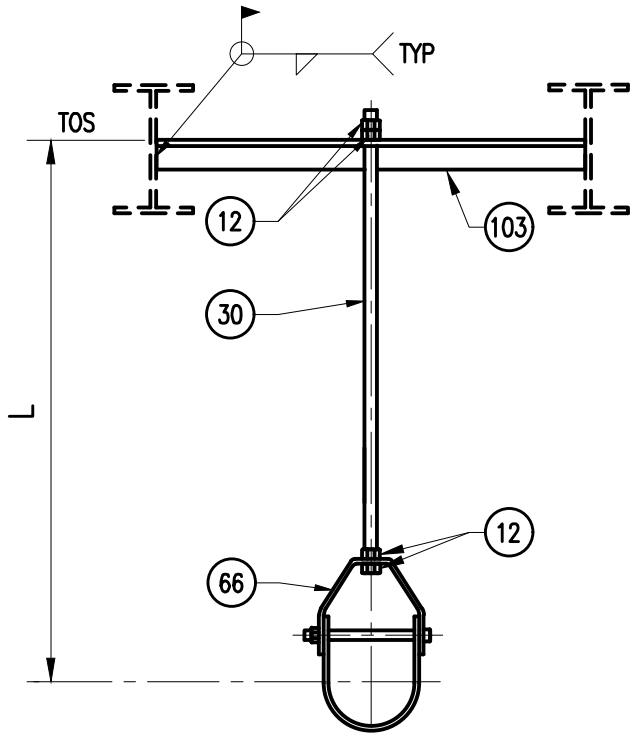
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA31	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	MAX LOAD (LB)	L
3"	1350	7"
4"	1430	7"
6"	1940	9"

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS, NO. 260
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 6" DIA.
2. SEE DRAWING FOR FIG 103 AND TOS.
3. NOT TO BE USED FOR LOADS SHOWN IN SUPPORT SPANS SPEC SS-039-004.
4. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAX LOADS LISTED.

HA32

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA32				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA32	REV: 0		

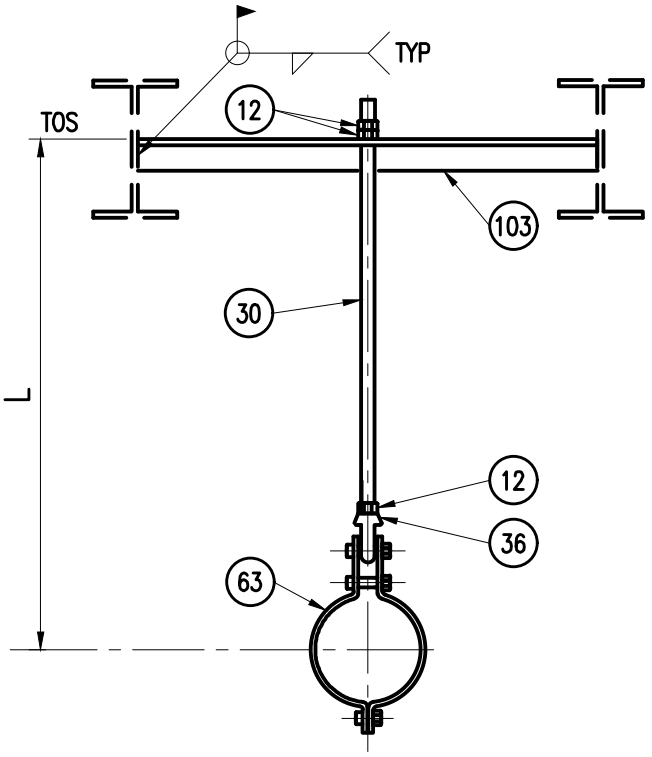
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
6"	1'-1"
8"	1'-3"
10"	1'-4"
12"	1'-6"
14"	1'-7"
16"	1'-8"
18"	1'-9"
20"	1'-11"
24"	2'-2"
30"	3'-3"
36"	3'-9"

HA33

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
63	HEAVY DUTY DOUBLE BOLT PIPE CLAMP, NO. 295H
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE SMALLER THAN 6" DIA.
2. SEE DRAWING FOR TOS AND FIG 103.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

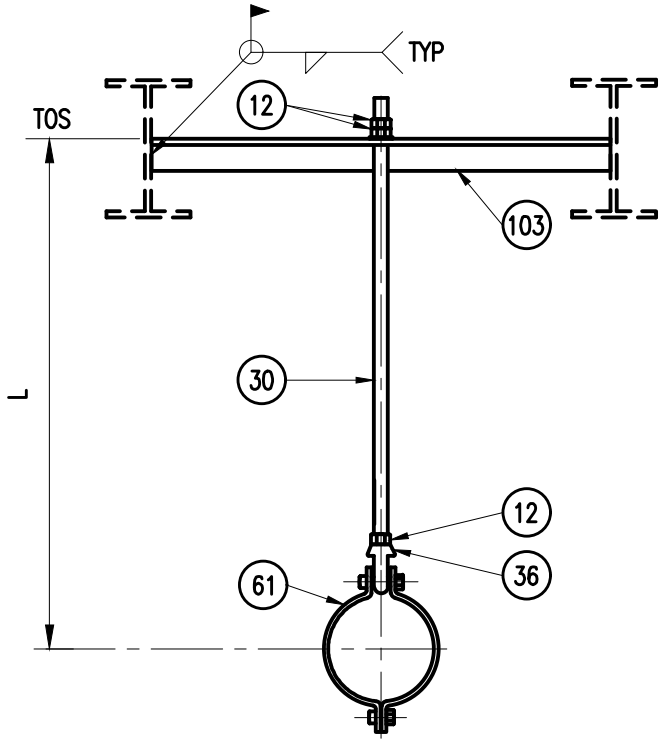
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA33	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	7"
4"	7"
6"	9"
8"	11"
10"	1'-2"
12"	1'-4"
14"	1'-4"
16"	1'-4"
18"	1'-7"
20"	1'-10"
24"	2'-1"
30"	2'-9"
36"	3'-1"

HA34

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 103.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

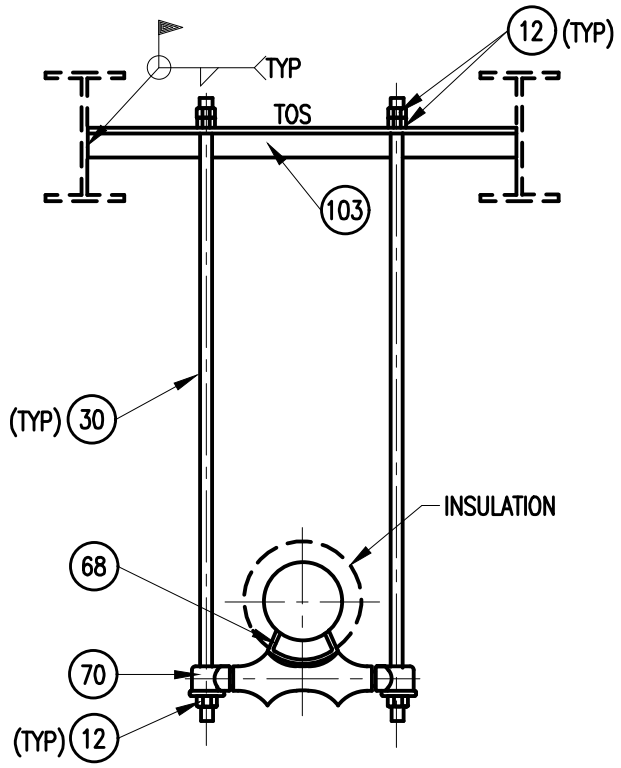
TITLE:	PIPE SUPPORT DETAIL – TYPE HA34				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA34	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	MAX LOAD (LB)
3"	700
4"	750
6"	1070
8"	1350

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
68	PIPE COVERING PROTECTION SADDLE NO. 160-166A
70	SINGLE PIPE ROLL, NO. 171
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. DO NOT USE SS-039-004 FOR ROD DIA SELECTION. USE ANVIL FIG 171 TABLE.
3. SEE DRAWING FOR FIG 103 AND TOS.
4. NOT TO BE USED FOR LOADS SHOWN IN SUPPORT SPANS SPEC SS-039-004.
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAX LOADS LISTED.

HA40

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

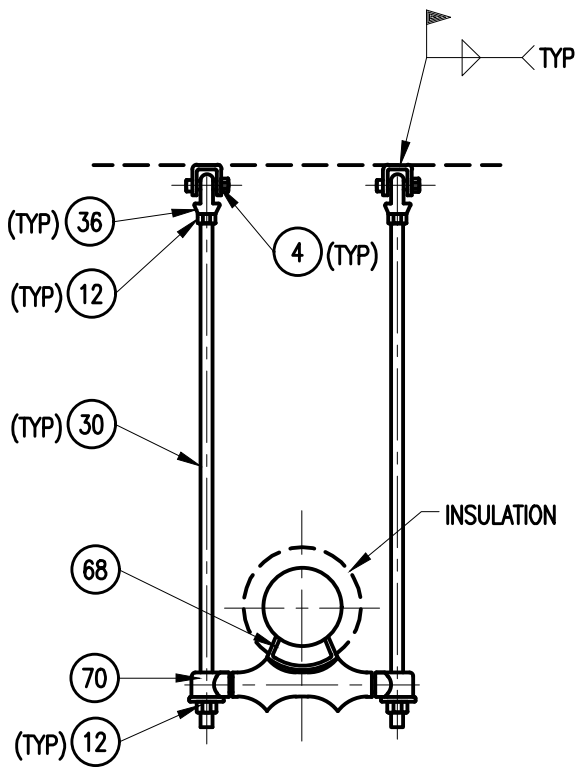
TITLE:	PIPE SUPPORT DETAIL – TYPE HA40				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA40	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE	MAX LOAD (LB)
3"	700
4"	750
6"	1070
8"	1350

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
68	PIPE COVERING PROTECTION SADDLE NO. 160-166A
70	SINGLE PIPE ROLL, NO. 171

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. DO NOT USE SS-039-004 FOR ROD DIA SELECTION. USE ANVIL FIG 171 TABLE.
3. NOT TO BE USED FOR LOADS SHOWN IN SUPPORT SPANS SPEC SS-039-004.
4. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAX LOADS LISTED.

HA41

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

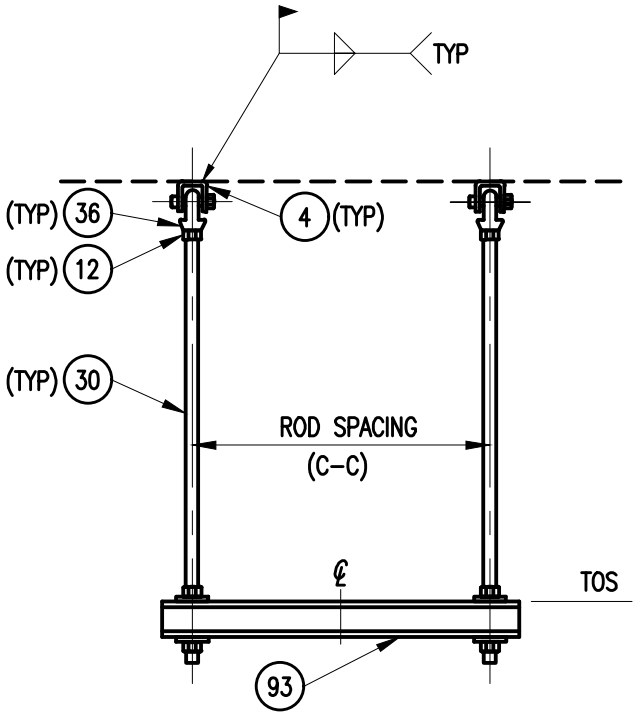
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA41	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
93	CHANNEL TRAPEZE HANGER

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR FIG 93, TOS AND C-C.

HA42

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

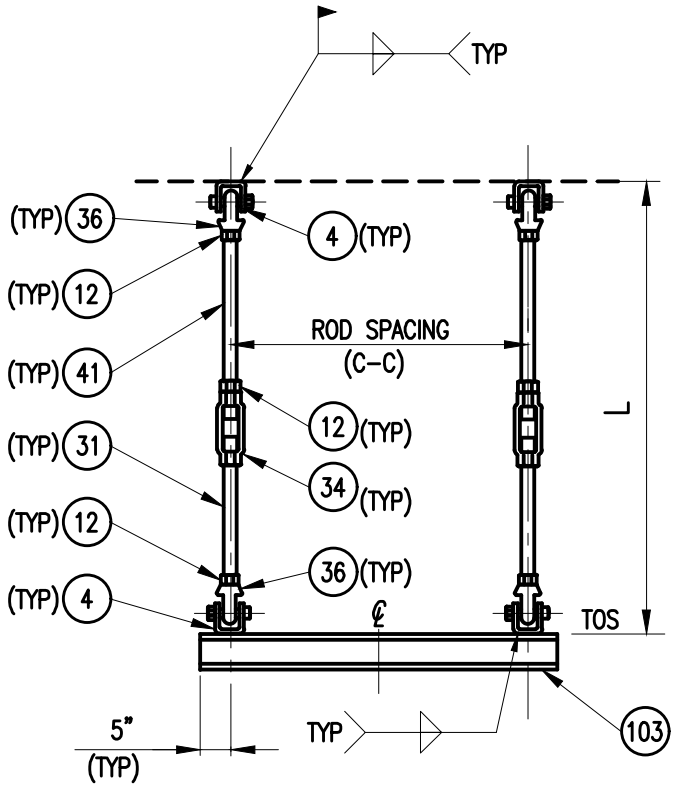
TITLE:	PIPE SUPPORT DETAIL – TYPE HA42				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA42	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
ROD SIZE	L
3/8"	2'–0"
1/2"	2'–1"
5/8"	2'–1"
3/4"	2'–2"
7/8"	2'–5"
1"	2'–6"
1 1/4"	2'–9"
1 1/2"	2'–11"
1 3/4"	3'–9"
2"	3'–10"
2 1/4"	4'–0"

HA43

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD–039–001

NOTES

1. SEE DRAWING FOR FIG 31, FIG 103, TOS AND C–C.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

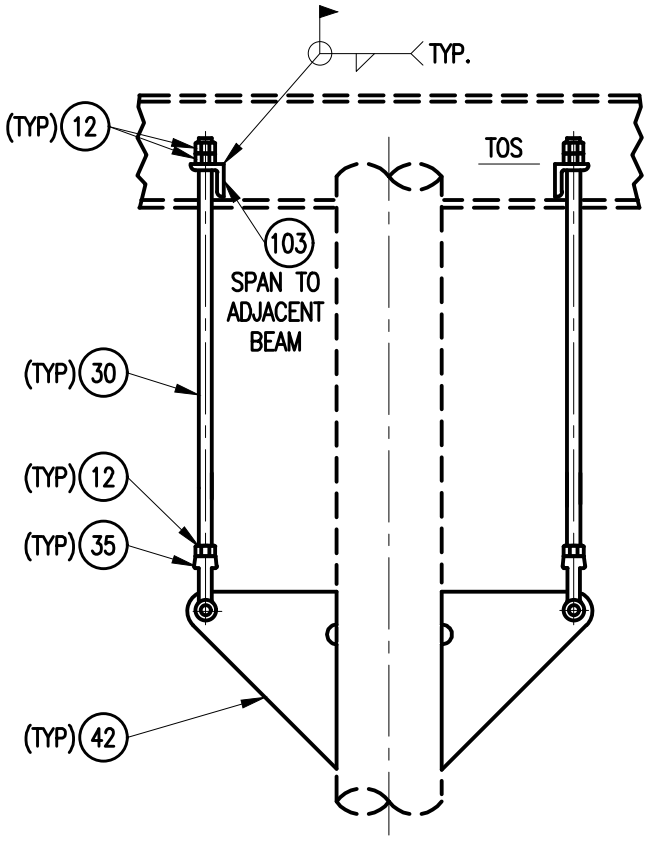
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–HA43	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



HA44

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
35	FS CLEVIS, NO. 299
42	WELDING LUG
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 103.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

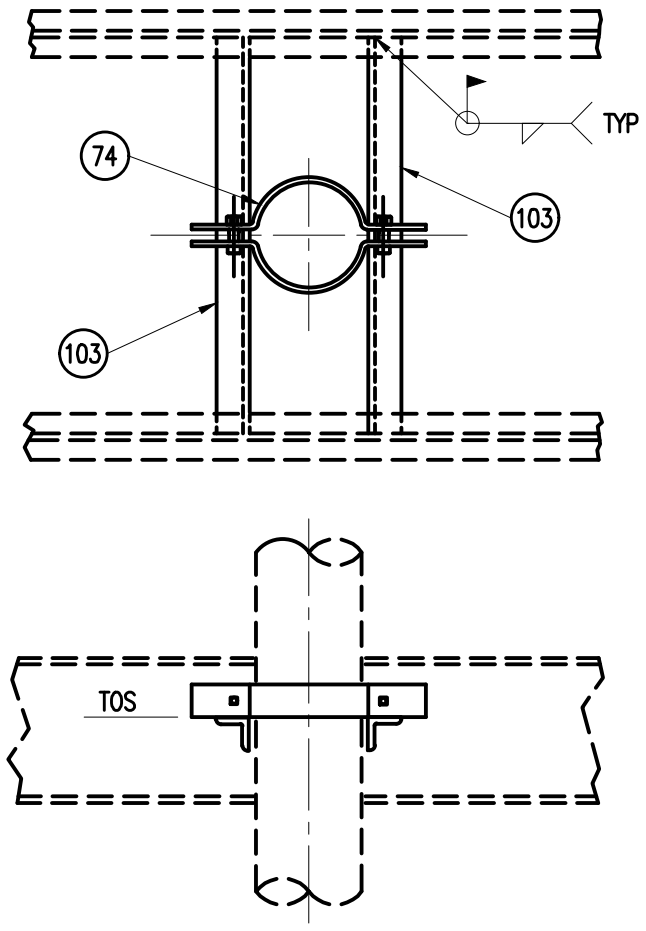
TITLE:	PIPE SUPPORT DETAIL – TYPE HA44				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA44	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
74	RISER CLAMP, NO. 261
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 103.
2, DO NOT USE FOR PIPE LARGER THAN 8" DIA.

HA50

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

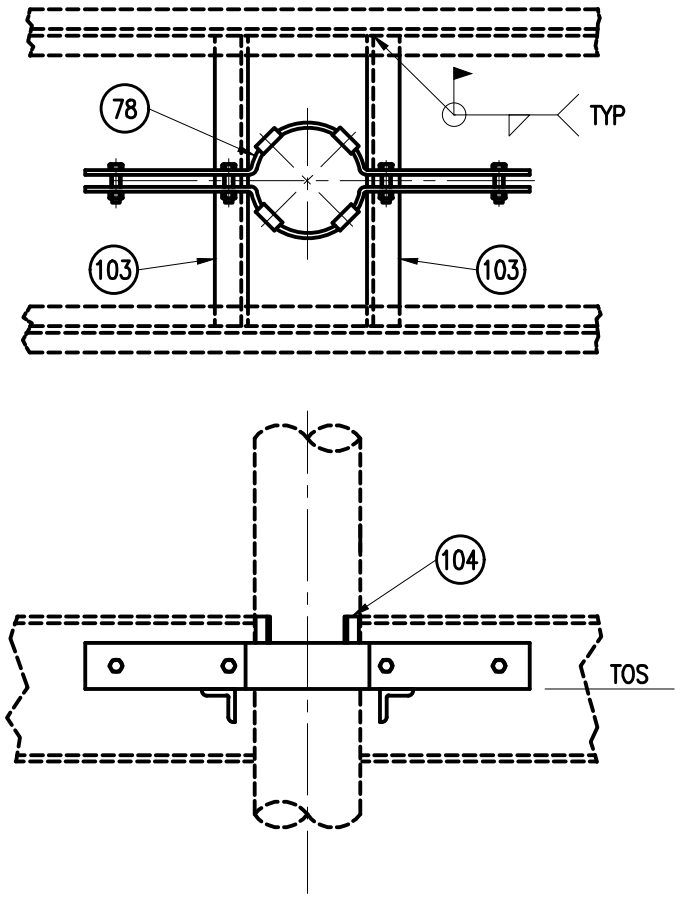
TITLE:	PIPE SUPPORT DETAIL – TYPE HA50				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA50	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
78	RISER CLAMP, NO. 40
103	FRAME IN STEEL
104	RISER SHEAR LUG

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 103.

HA51

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

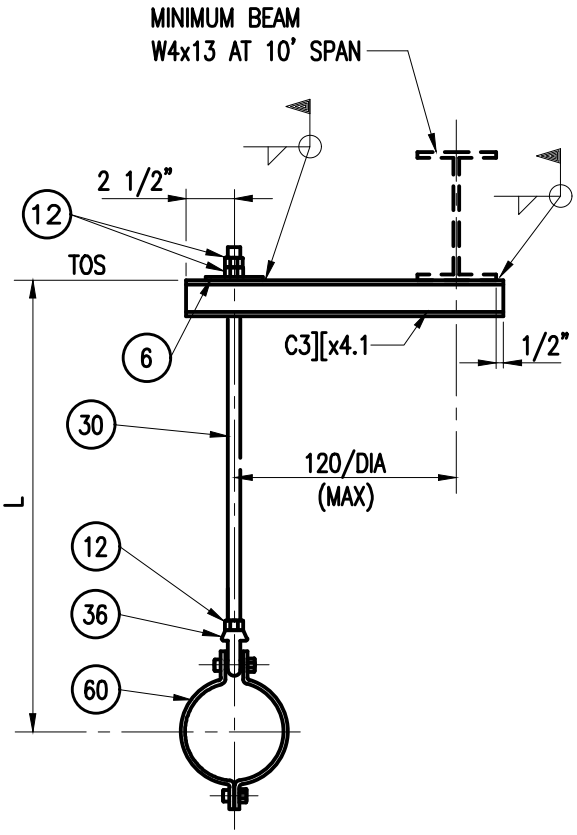
TITLE:	PIPE SUPPORT DETAIL – TYPE HA51				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA51	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1040	7"
4"	1040	7"
6"	1615	9"
8"	1615	11"

HA60

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDNESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

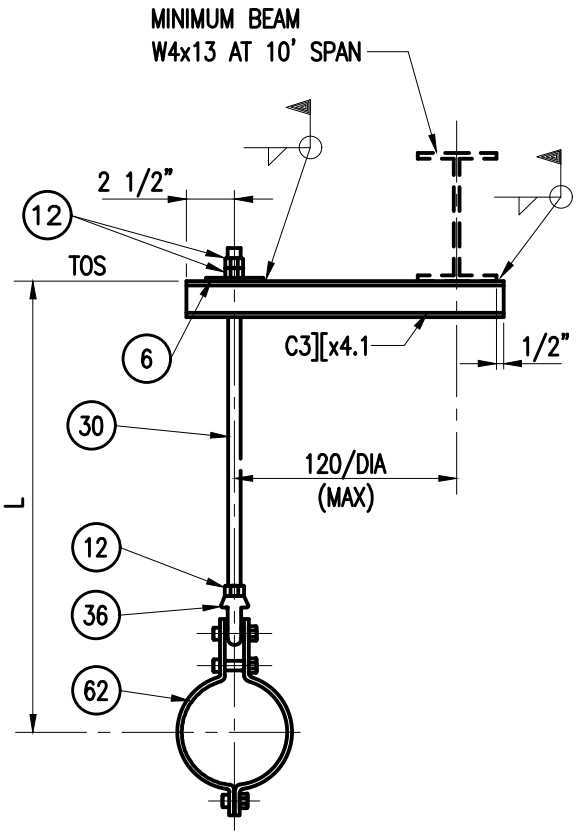
TITLE:	PIPE SUPPORT DETAIL – TYPE HA60				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA60	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1350	10"
4"	2160	11"
6"	2865	1'-1"
8"	2865	1'-3"

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDNESS EYE NUT, NO. 290
62	DOUBLE BOLT PIPE CLAMP, NO. 295

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HA61

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

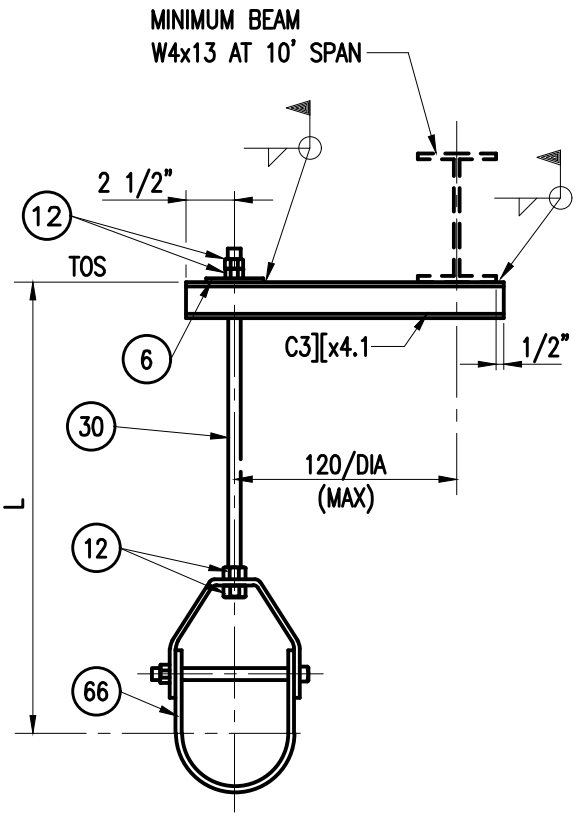
TITLE:	PIPE SUPPORT DETAIL – TYPE HA61				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA61	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1350	10"
4"	1430	11"
6"	1940	1'-0"
8"	2000	1'-2"

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS HANGER, NO. 260

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HA62

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

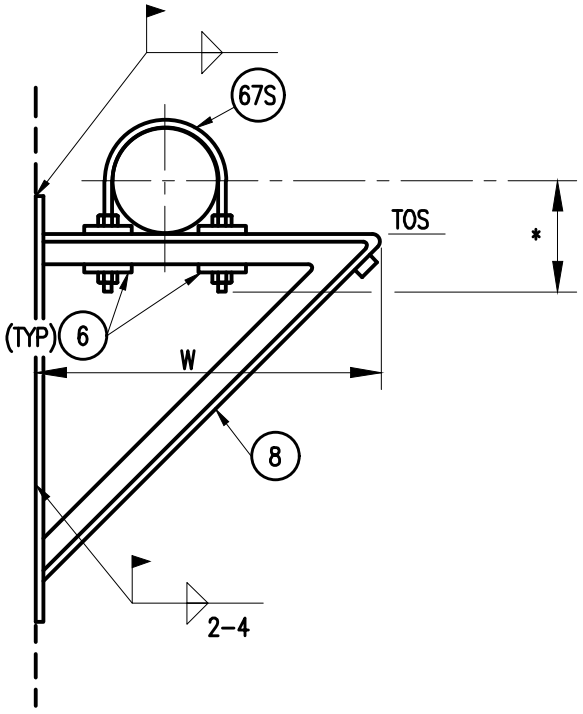
TITLE:	PIPE SUPPORT DETAIL – TYPE HA62				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA62	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
8	HEAVY WELDED STEEL BRACKET, NO. 199
67S	SPECIAL U-BOLT, NO. 137S

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 12" DIA.
2. * TO BE DETERMINED BY CONTRACTOR.
3. SEE DRAWING FOR "W" AND TOS.
4. MAX ALLOWABLE LOAD 3000 LB.

HA70

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA70				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA70	REV: 0		

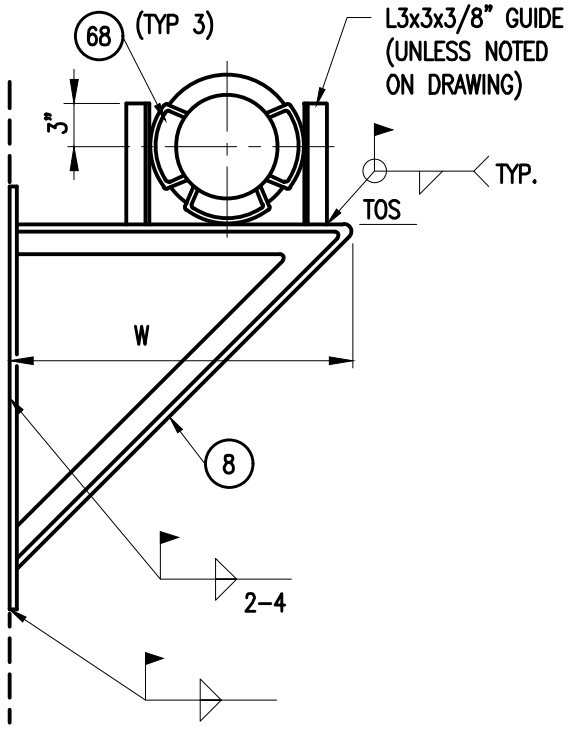
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HA71

PARTS LIST

NO.	DESCRIPTION
8	HEAVY WELDED STEEL BRACKET, NO. 199
68	PIPE COVERING PROTECTION SADDLE NO. 160-166A

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 12" DIA.
2. SEE DRAWING FOR "W", TOS AND GUIDE SIZE, IF DIFFERENT FROM NOTED.
3. MAX ALLOWABLE LOAD 3000 LB.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

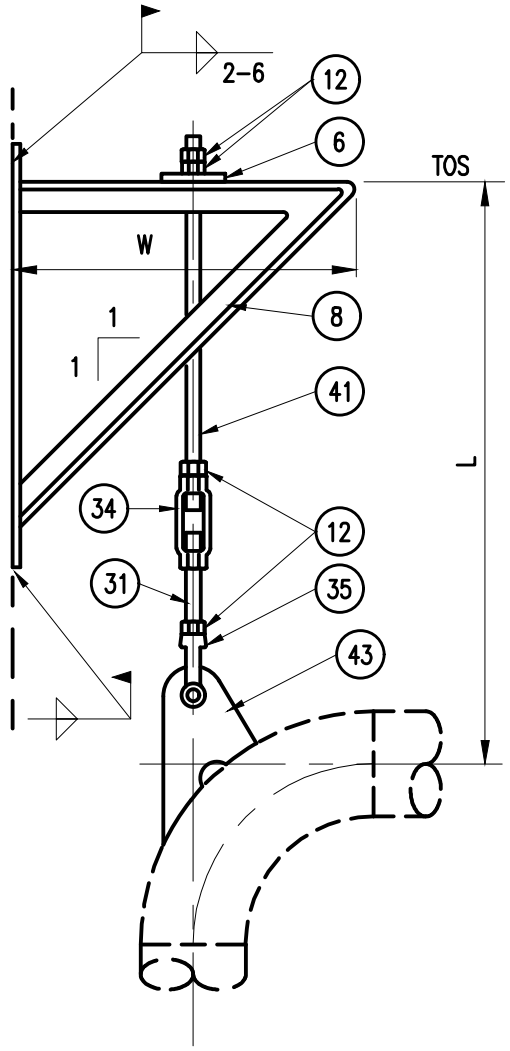
TITLE:	PIPE SUPPORT DETAIL - TYPE HA71				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA71	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
10"	3'–2"
12"	3'–2"

BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HA72

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
8	HEAVY WELDED STEEL BRACKET, NO. 199
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
43	WELDING LUG

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD–039–001

NOTES

1. SEE DRAWING FOR "W", TOS AND "L".
2. MAX ALLOWABLE LOAD 3000 LB.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

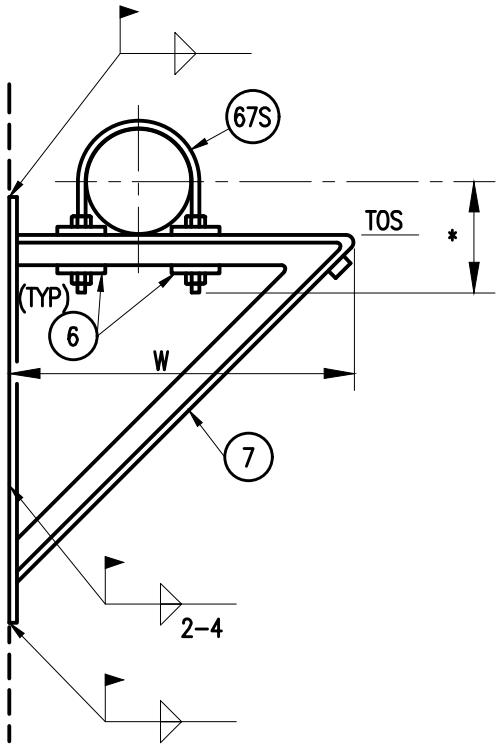
TITLE:	PIPE SUPPORT DETAIL – TYPE HA72				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–HA72	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2
W	12"	18"	24"

HA73

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
7	MEDIUM WELDED STEEL BRACKET, NO. 195
67S	SPECIAL U-BOLT, NO. 137S

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. * TO BE DETERMINED BY CONTRACTOR.
3. SEE DRAWING FOR "W" AND TOS.
4. MAX ALLOWABLE LOAD 1500 LB.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA73				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA73	REV: 0		

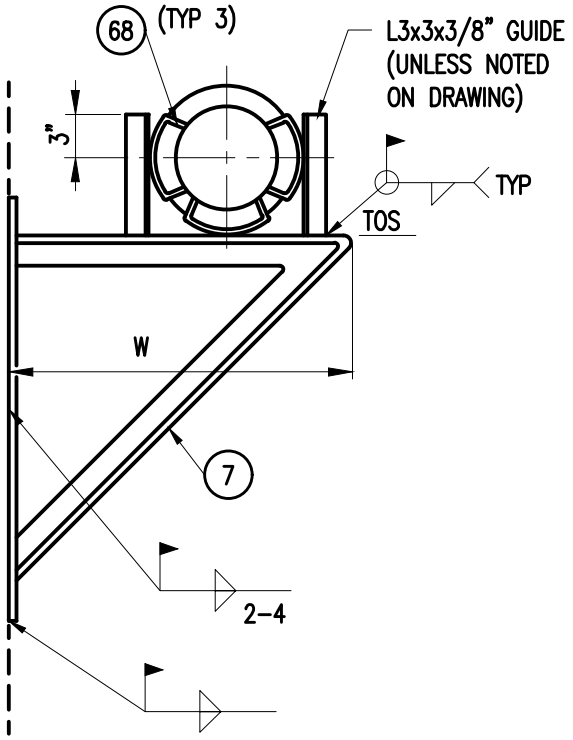
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2
W	12"	18"	24"

HA74

PARTS LIST

NO.	DESCRIPTION
7	MEDIUM WELDED STEEL BRACKET, NO. 195
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166A

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. SEE DRAWING FOR "W", TOS AND GUIDE SIZE, IF DIFFERENT FROM NOTED.
3. MAX ALLOWABLE LOAD 1500 LB.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

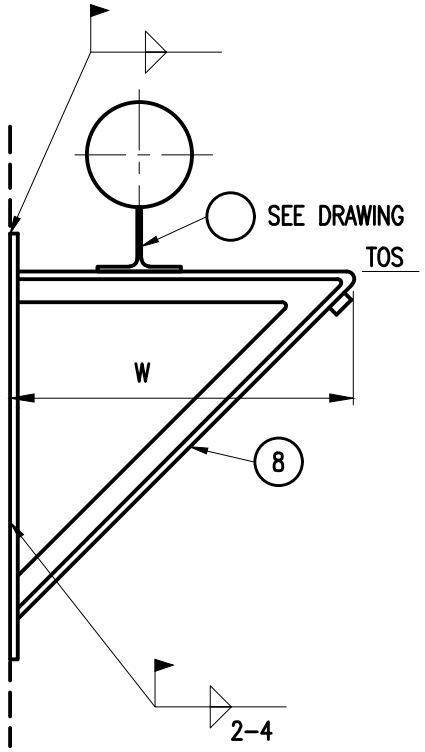
TITLE:	PIPE SUPPORT DETAIL - TYPE HA74				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA74	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HA75

PARTS LIST

NO.	DESCRIPTION
8	HEAVY WELDED STEEL BRACKET, NO. 199
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 12" DIA.
2. SEE DRAWING FOR "W", INSULATION SHOE AND TOS.
3. MAX ALLOWABLE LOAD 3000 LB.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA75				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA75	REV: 0		

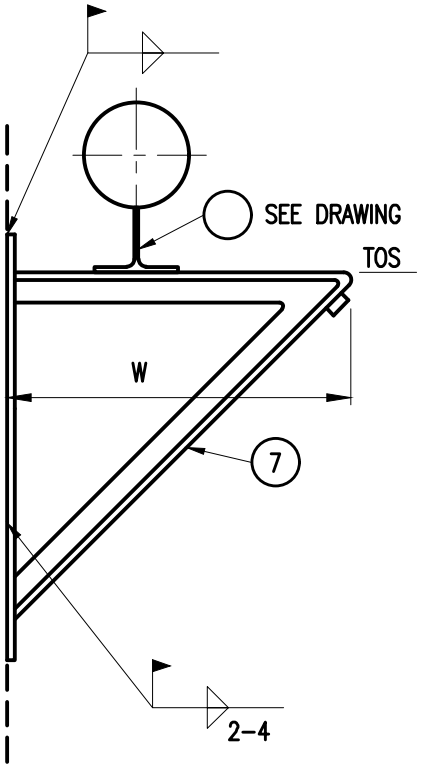
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HA76

PARTS LIST

NO.	DESCRIPTION
7	MEDIUM WELDED STEEL BRACKET, NO. 195
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. SEE DRAWING FOR "W", TOS AND INSULATION SHOE.
3. MAX ALLOWABLE LOAD 1500 LB.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA76				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA76	REV: 0		

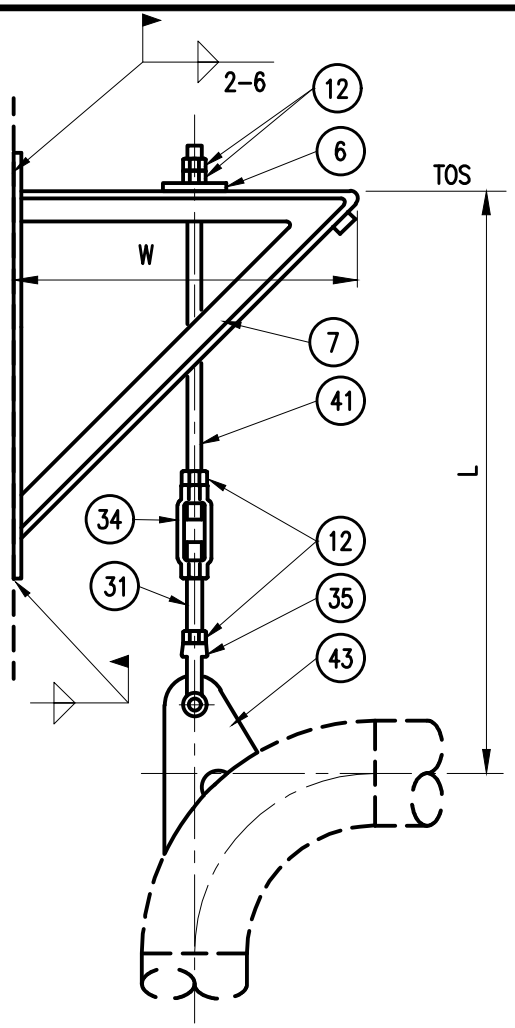
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-7"
4"	2'-9"
6"	2'-10"
8"	3'-2"

BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HA77

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
7	MEDIUM WELDED STEEL BRACKET, NO. 195
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
43	WELDING LUG

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
3. SEE DRAWING FOR "W", TOS AND "L".
4. MAX ALLOWABLE LOAD 1500 LB.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

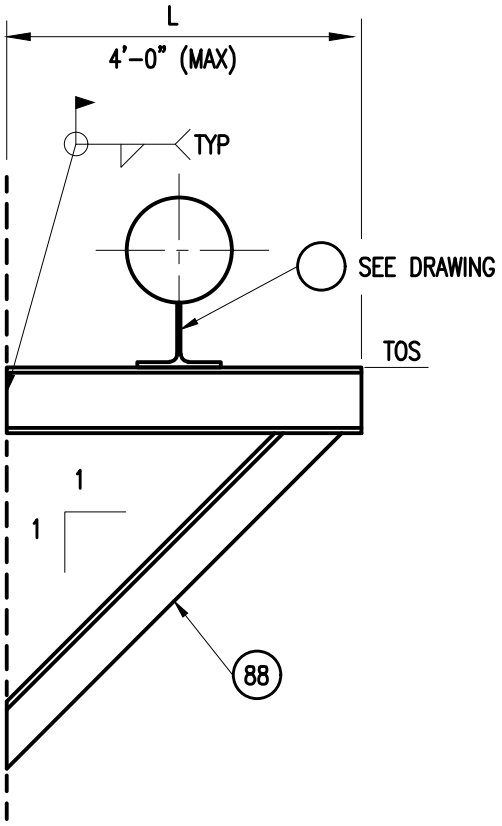
TITLE:	PIPE SUPPORT DETAIL - TYPE HA77				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA77	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



HA78

PARTS LIST

NO.	DESCRIPTION
88	FABRICATED STEEL BRACKET
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS, FIG 88, "L", & INSULATION SHOE.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA78				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA78	REV: 0		

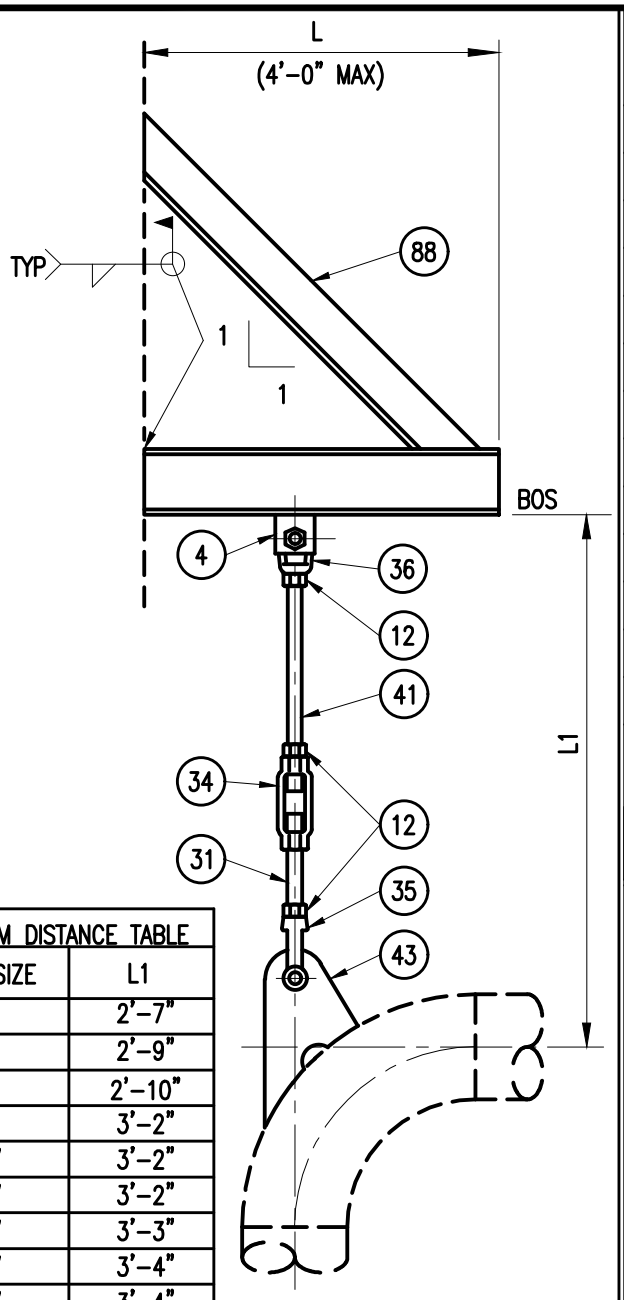
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L1
3"	2'-7"
4"	2'-9"
6"	2'-10"
8"	3'-2"
10"	3'-2"
12"	3'-2"
14"	3'-3"
16"	3'-4"
18"	3'-4"
20"	3'-5"
24"	3'-8"
30"	4'-1"

HA79

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
35	FS CLEVIS, NO. 299
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
43	WELDING LUG
88	FABRICATED STEEL BRACKET

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 30" DIA.
2. SEE DRAWING FOR FIG 88, "L", "L1" AND BOS.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

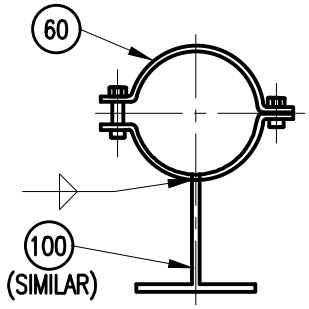
TITLE:	PIPE SUPPORT DETAIL – TYPE HA79				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA79	REV: 0		

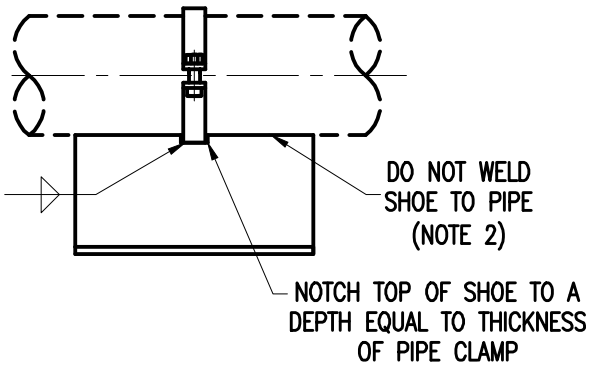
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.





PARTS LIST

NO.	DESCRIPTION
60	PIPE CLAMP, NO. 212
100	4" INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. USE FOR 6" DIA AND SMALLER PIPE WITH UP TO 3" INSULATION.
2. TOP OF SHOE (FIG 100) SAME ELEVATION AS BOTTOM OF PIPE.

HA85

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA85				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA85	REV: 0		

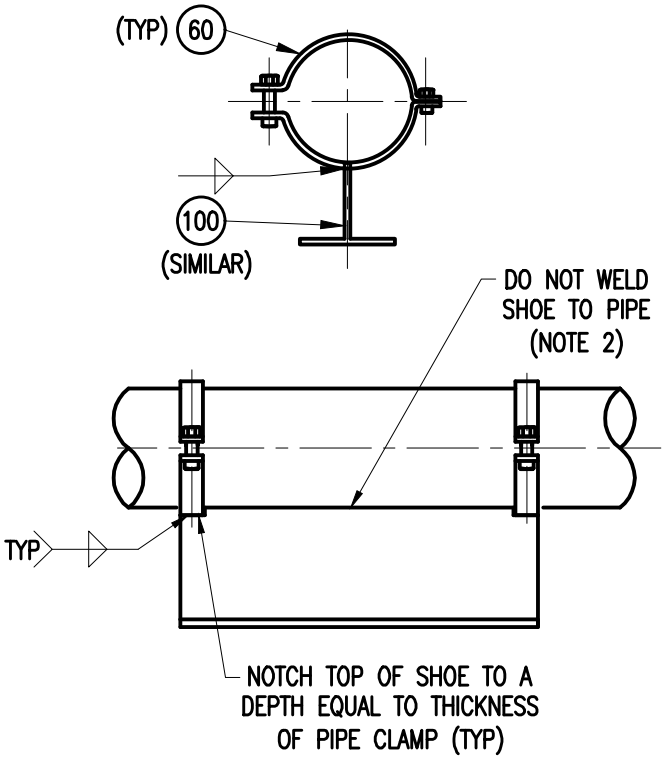
ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
60	PIPE CLAMP NO. 212
100	4" INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. USE FOR 8" DIA PIPE WITH UP TO 3" INSULATION.
2. TOP OF SHOE (FIG 100) SAME ELEVATION AS BOTTOM OF PIPE.

HA86

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

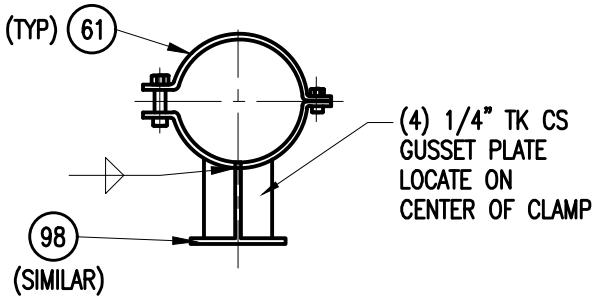
TITLE:	PIPE SUPPORT DETAIL – TYPE HA86				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA86	REV: 0		

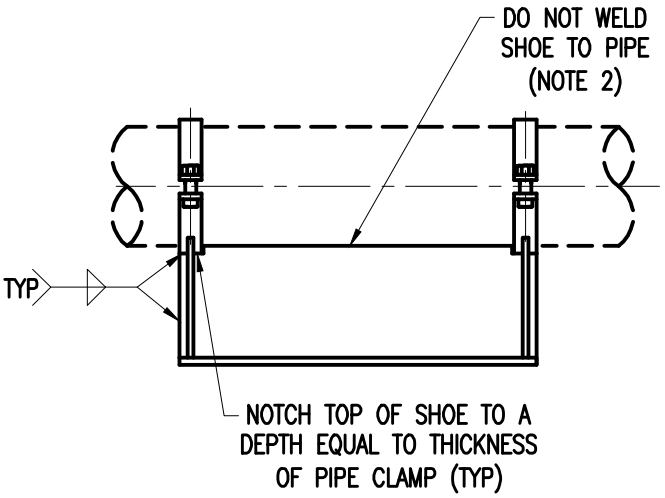
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.





PARTS LIST

NO.	DESCRIPTION
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216
98	4" INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. USE FOR 10" DIA AND LARGER PIPE WITH UP TO 3" INSULATION.
2. TOP OF SHOE (FIG 98) SAME ELEVATION AS BOTTOM OF PIPE.

HA87

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

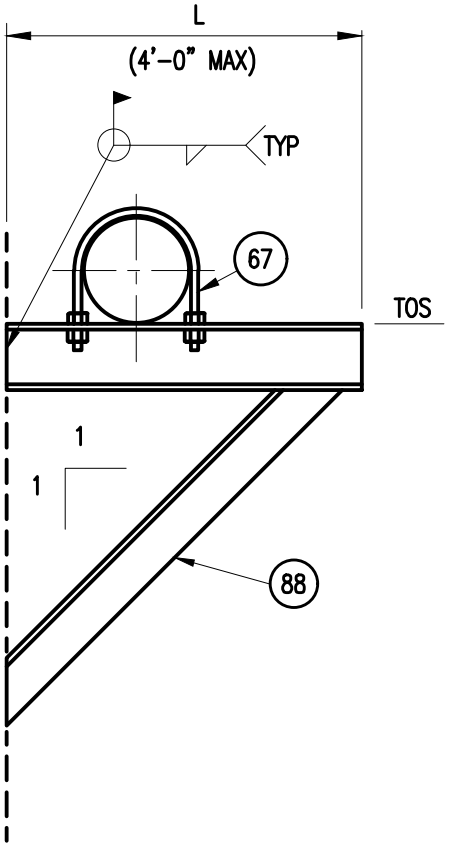
TITLE:	PIPE SUPPORT DETAIL – TYPE HA87				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA87	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
67	U-BOLT, NO. 137
88	FABRICATED STEEL BRACKET

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR FIG 88, "L" AND TOS.

HA88

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA88				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA88	REV: 0		

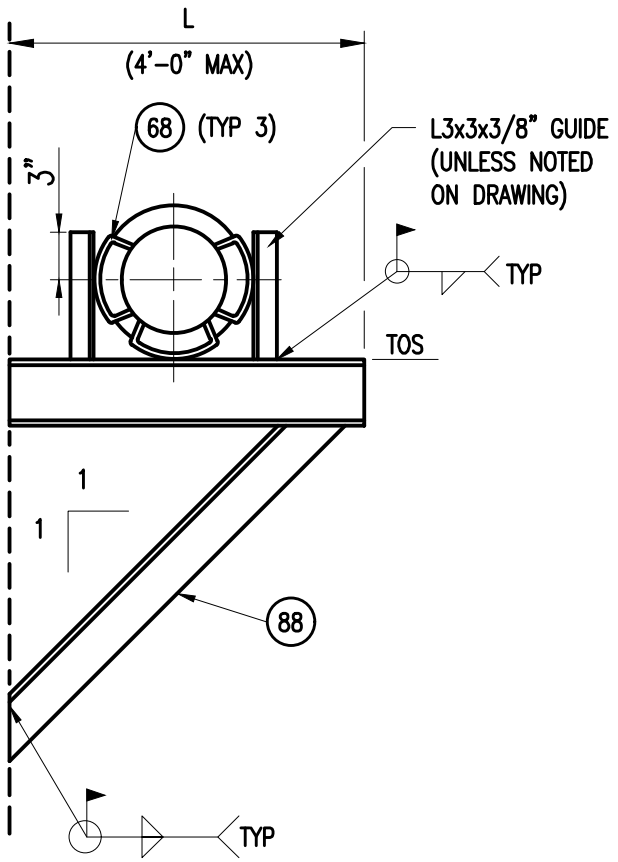
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



HA89

PARTS LIST

NO.	DESCRIPTION
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166A
88	FABRICATED STEEL BRACKET

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR FIG 88, "L", TOS AND GUIDE SIZE, IF DIFFERENT FROM NOTED.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

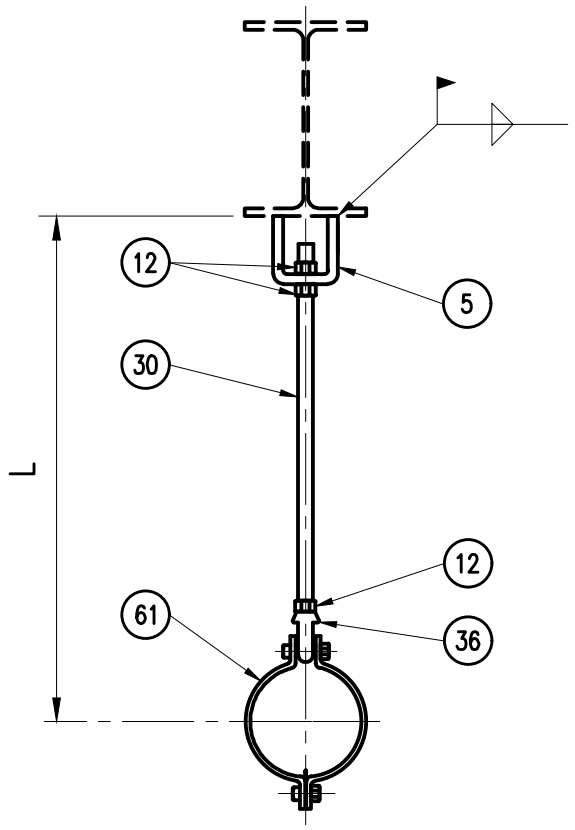
TITLE:	PIPE SUPPORT DETAIL - TYPE HA89				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA89	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



DISTANCE TABLES		
PIPE SIZE	MIN L DIM	MAX L DIM
3"	10 1/2"	2'-1"
4"	11 1/4"	2'-3"
6"	1'-1 1/4"	2'-4"
8"	1'-2 1/4"	2'-8"
10"	1'-5"	2'-10"
12"	1'-6 1/2"	2'-11"
14"	1'-8 3/4"	3'-0"
16"	1'-9 3/4"	3'-1"
18"	2'-1 1/4"	3'-5"
20"	2'-4 1/2"	3'-9"

HA90

PARTS LIST

NO.	DESCRIPTION
5	INVERTED WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. USE ONLY FOR PIPE LINES WITH NO MOVEMENT AND NOT SUBJECT TO HAMMER.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HA90				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HA90	REV: 0		

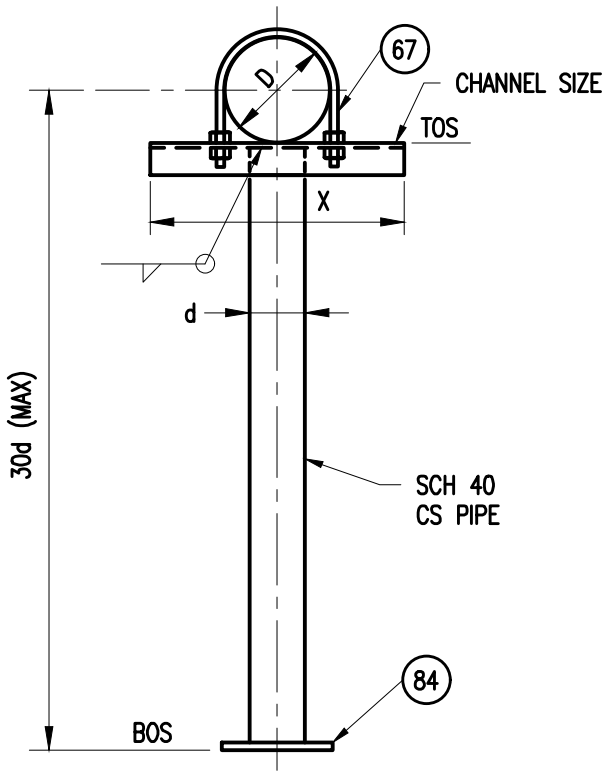
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	12"	C6x10.5	2"
6"& 8"	16"	C6x10.5	3"
10"& 12"	20"	C7x12.25	4"
14"& 16"	24"	C9x13.4	6"
18"& 20"	28"	C12x25	8"

PARTS LIST

NO.	DESCRIPTION
67	STANDARD U-BOLT, NO. 137
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

HB01

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HB01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB01	REV: 0		

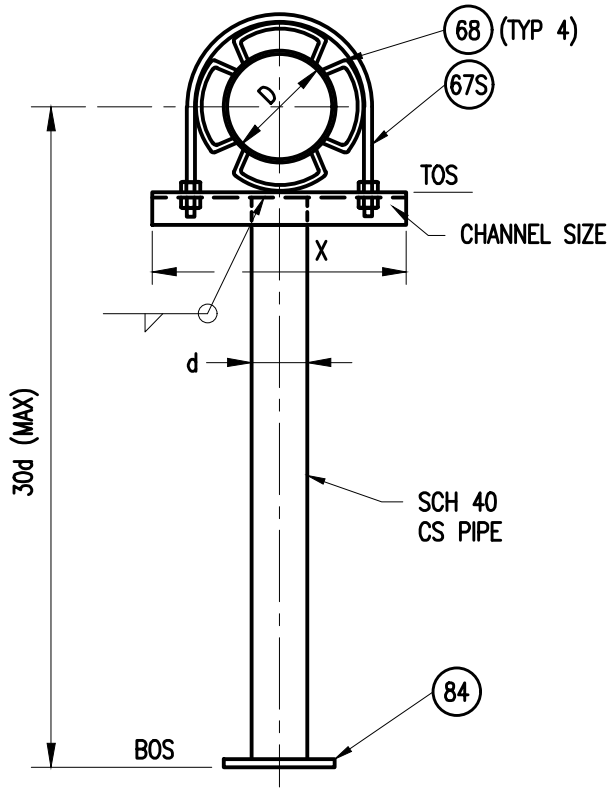
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	20"	C6x10.5	2"
6"& 8"	24"	C6x10.5	3"
10"& 12"	28"	C7x12.25	4"
14"& 16"	32"	C9x13.4	6"
18"& 20"	36"	C12x25	8"

HB02

PARTS LIST

NO.	DESCRIPTION
67S	STANDARD U-BOLT, NO. 137S
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166A
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 67S.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

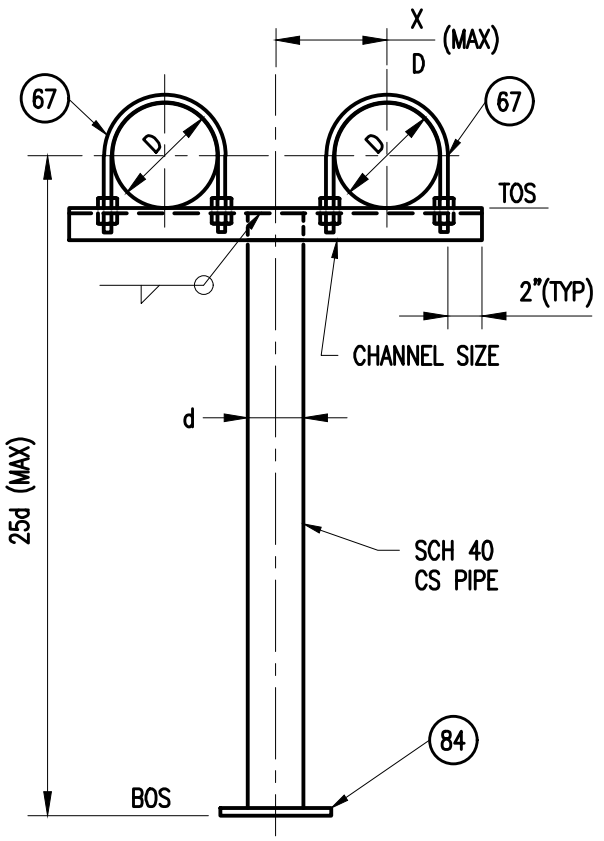
TITLE:	PIPE SUPPORT DETAIL - TYPE HB02				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB02	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3" & 4"	120	C6x10.5	2"
6" & 8"	120	C6x10.5	3"
10" & 12"	200	C7x12.25	4"
14" & 16"	300	C9x13.4	6"
18" & 20"	350	C12x25	8"

PARTS LIST

NO.	DESCRIPTION
67	STANDARD U-BOLT, NO. 137
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

HB03

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

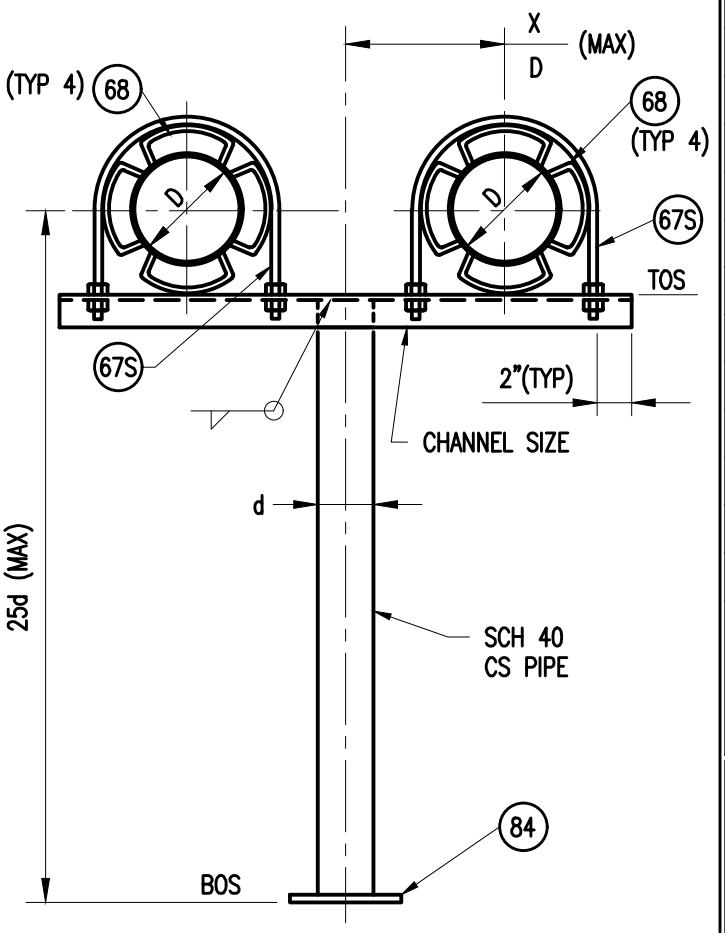
TITLE:	PIPE SUPPORT DETAIL – TYPE HB03				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB03	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	120	C6x10.5	2"
6"& 8"	120	C6x10.5	3"
10"& 12"	200	C7x12.25	4"
14"& 16"	300	C9x13.4	6"
18"& 20"	350	C12x25	8"

HB04

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 67S.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

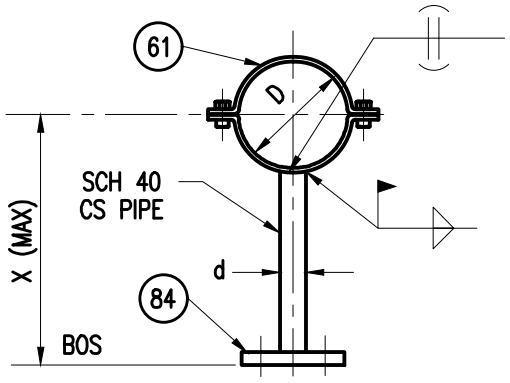
TITLE:	PIPE SUPPORT DETAIL - TYPE HB04				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB04	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d
4"	5'-6"	2"
6" & 8"	5'-0"	3"
10" & 12"	4'-6"	3"
14" & 16"	4'-0"	4"
18"- 24"	3'-6"	6"

PARTS LIST

NO.	DESCRIPTION
61	HEAVY PIPE CLAMP, NO. 216
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. BOS IS TOC PLUS 1 1/2" GROUT.

HB10

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

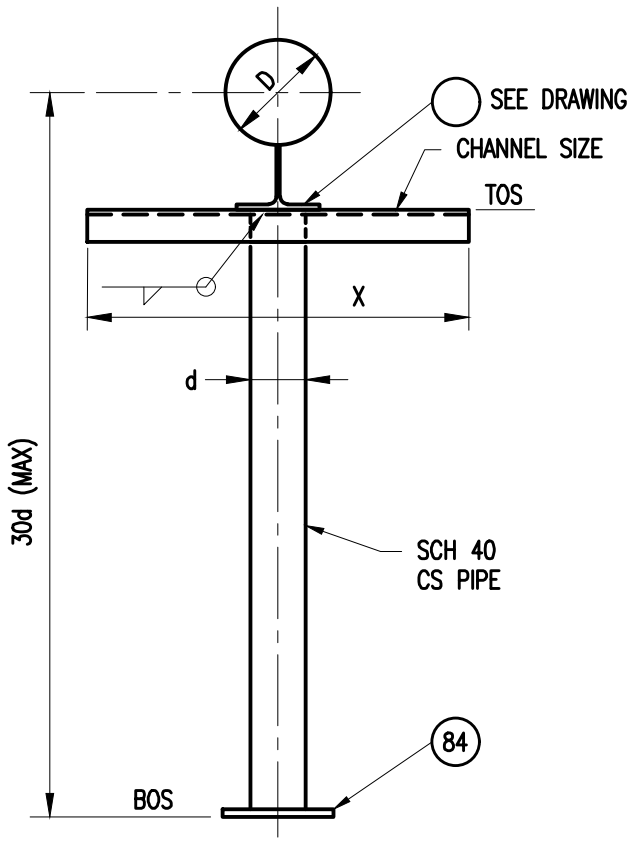
TITLE:	PIPE SUPPORT DETAIL - TYPE HB10				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB10	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	12"	C6x10.5	2"
6"& 8"	16"	C6x10.5	3"
10"& 12"	20"	C7x12.25	4"
14"& 16"	24"	C9x13.4	6"
18"& 20"	28"	C12x25	8"

HB11

PARTS LIST

NO.	DESCRIPTION
84	C.S. BASE PLATE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND INSULATION SHOE.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

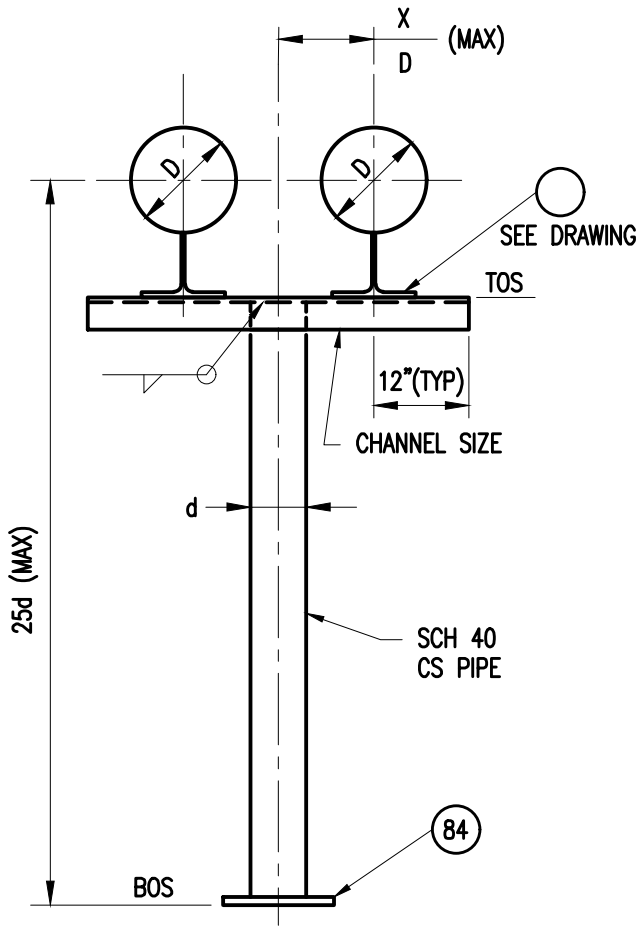
TITLE:	PIPE SUPPORT DETAIL – TYPE HB11				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB11	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	120	C6x10.5	2"
6"& 8"	120	C6x10.5	3"
10"& 12"	200	C7x12.25	4"
14"& 16"	300	C9x13.4	6"
18"& 20"	350	C12x25	8"

HB12

PARTS LIST

NO.	DESCRIPTION
84	CS BASE PLATE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND INSULATION SHOE.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

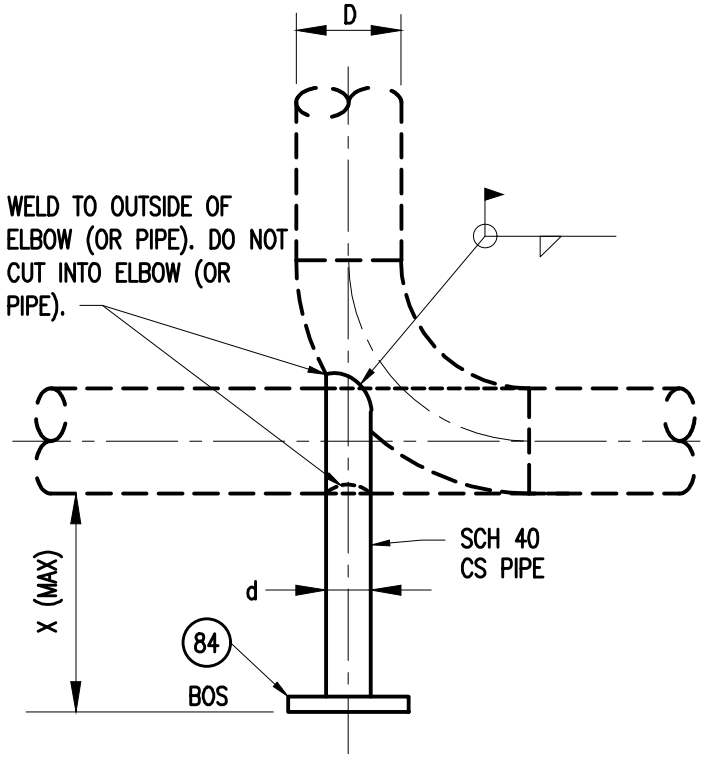
TITLE:	PIPE SUPPORT DETAIL – TYPE HB12				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB12	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d
3"– 4"	5'–6"	2"
6" & 8"	5'–0"	2"
10" & 12"	4'–6"	3"
14" & 16"	4'–0"	4"
18"– 24"	3'–6"	4"

HB20

PARTS LIST

NO.	DESCRIPTION
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD–039–001

NOTES

1. BOS IS TOC PLUS 1 1/2" GROUT.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HB20				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–HB20	REV: 0		

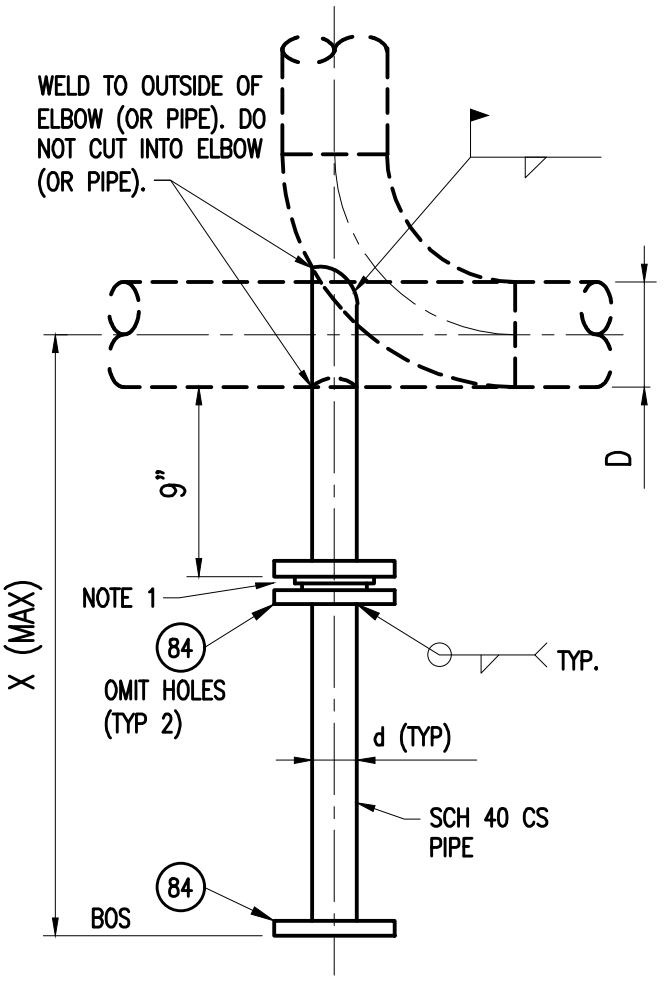
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d	MAX LOAD (LB)
3" & 4"	3'-0"	2"	620
6" & 8"	3'-6"	4"	2000
10" & 12"	4'-0"	6"	4000
14" & 16"	4'-6"	8"	9000
18"- 24"	5'-0"	10"	14500

HB100

PARTS LIST

NO.	DESCRIPTION
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. FILLED TEFLON UPPER AND LOWER SLIDE PLATES. TACK WELD TO FIG 84.
2. SEE DRAWING FOR BOS.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HB100				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HB100	REV: 0		

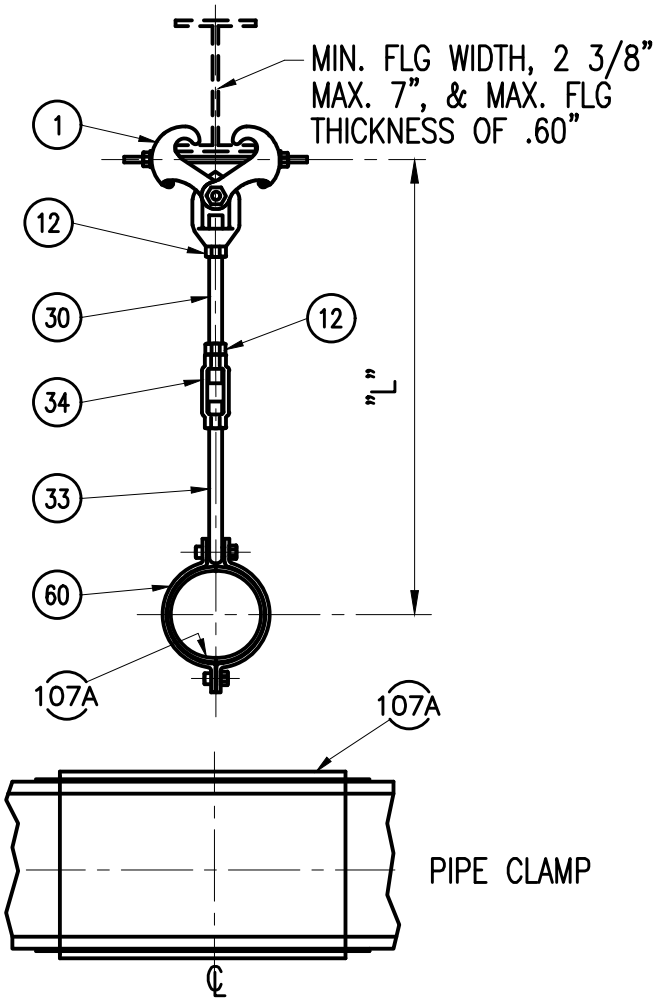
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	2'-1"
4"	2'-2"
6"	2'-4"
8"	2'-6"

HF01

PARTS LIST

NO.	DESCRIPTION
1	M.I. BEAM CLAMP, NO. 218
12	HEAVY SERIES HEX NUT TO A 194
30	MACHINE THREADED ROD, NO. 140
33	WELDED EYE ROD (L.H.), NO. 278L
34	F.S. TURNBUCKLE, NO. 230
60	SINGLE BOLT PIPE CLAMP, NO. 212
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR LOADS GREATER THAN 1365 LBS., MAX. ROD SIZE 7/8".

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

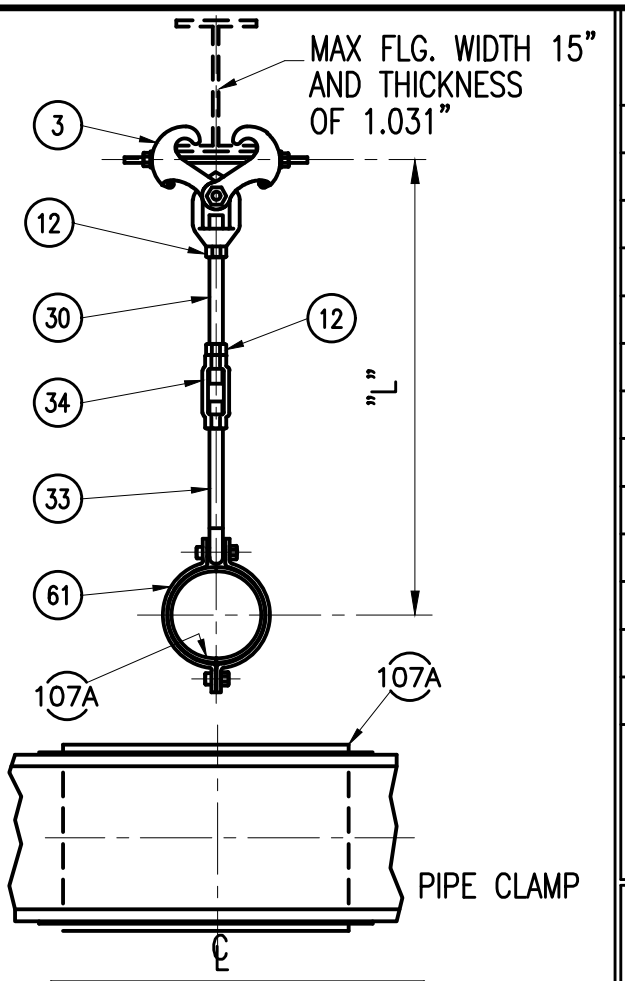
TITLE:	PIPE SUPPORT DETAIL - TYPE HF01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF01	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	2'-2"
4"	2'-3"
6"	2'-4"
8"	2'-9"
10"	2'-11"
12"	3'-0"
14"	3'-2"
16"	3'-3"
18"	3'-7"
20"	3'-9"

HF02

PARTS LIST

NO.	DESCRIPTION
3	F.S. BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
33	WELDED EYE ROD (L.H.), NO. 278L
34	F.S. TURNBUCKLE, NO. 230
61	HEAVY DUTY PIPE CLAMP, NO. 216
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 20" DIAMETER.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

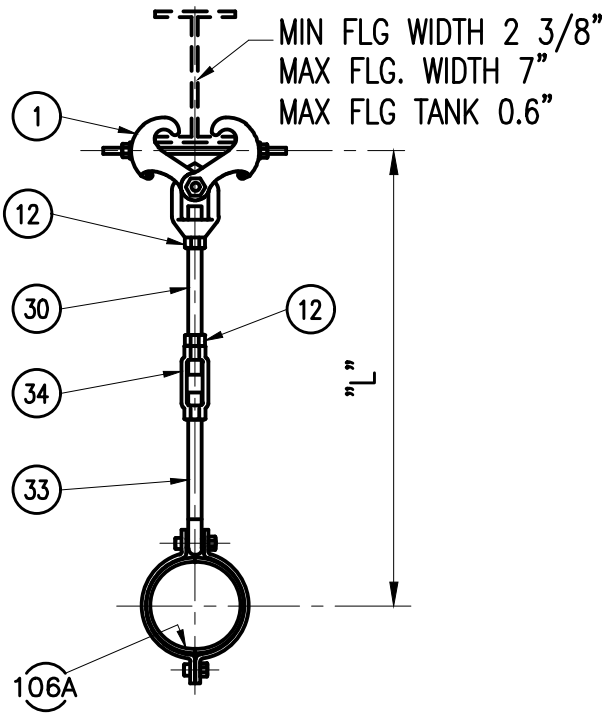
TITLE:	PIPE SUPPORT DETAIL - TYPE HF02				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF02	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
1	M.I. BEAM CLAMP, NO. 218/EXT. PIECE GRINNELL 157
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
33	WELDED EYE ROD (L.H.), NO 278L
34	F.S. TURNBUCKLE, NO. 230
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	2'-1"
4"	2'-2"
6"	2'-4"
8"	2'-6"

NOTES

1. DO NOT USE FOR LOADS GREATER THAN 1365 LBS. MAXIMUM ROD SIZE 7/8.

HF03

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

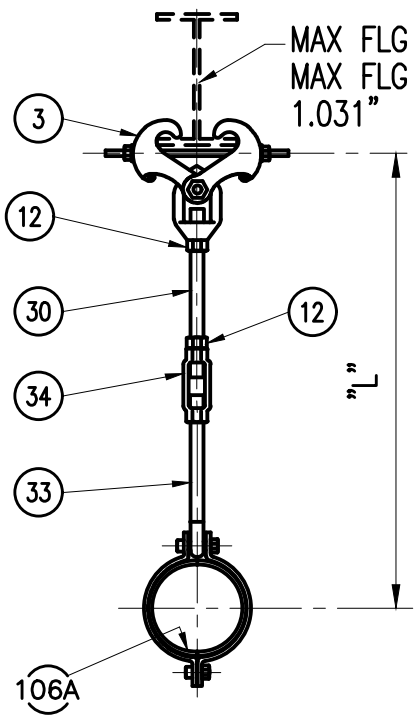
TITLE:	PIPE SUPPORT DETAIL – TYPE HF03				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF03	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
3	F.S. BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
33	WELDED EYE ROD (L.H.), NO. 278L
34	F.S. TURNBUCKLE, NO. 230
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3	2'-2"
4	2'-3"
6	2'-4"
8	2'-9"
10	2'-11"
12	3'-0"
14	3'-2"
16	3'-3"
18	3'-7"
20	3'-9"

HF04

NOTES

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HF04				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF04	REV: 0		

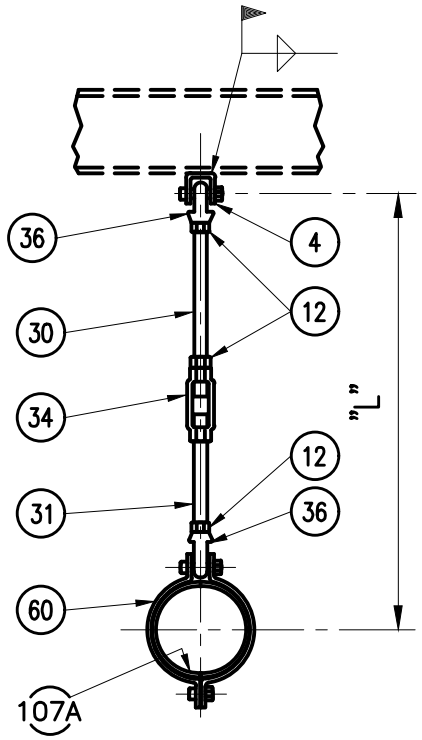
ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENTS, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
31	MACHINE THREADED ROD, (R&L) NO. 253
34	F.S TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	2'-2"
4"	2'-4"
6"	2'-5"
8"	2'-9"

HF10

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HF10				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF10	REV: 0		

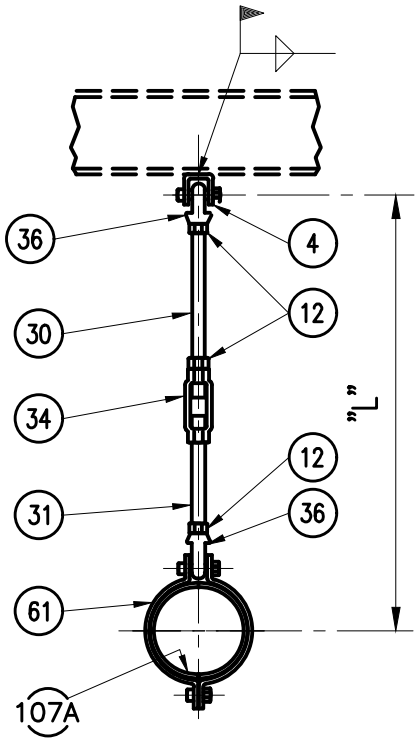
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
31	MACHINE THREADED ROD, (R&L) NO. 253
34	F.S. TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
61	HEAVY DUTY PIPE CLAMP, NO. 216
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
10"	2'-11"
12"	3'-0"
14"	3'-1"
16"	3'-2"
18"	3'-6"
20"	3'-10"
24"	4'-2"

NOTES

HF11

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

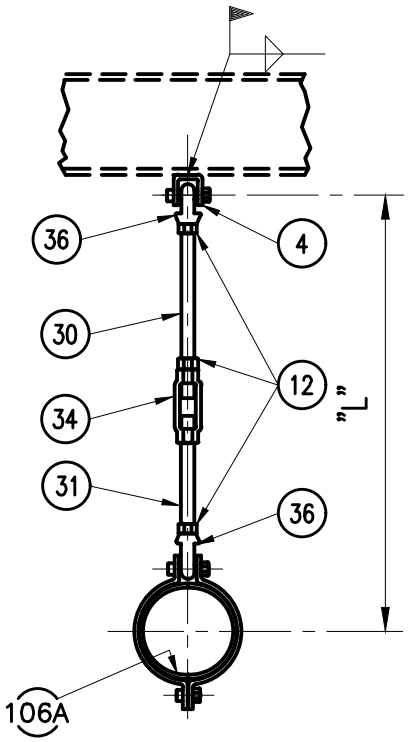
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF11	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
31	MACHINE THREADED ROD, (R&L) NO. 253
34	F.S. TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	2'-2"
4"	2'-4"
6"	2'-5"
8"	2'-9"

HF12

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HF12				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF12	REV: 0		

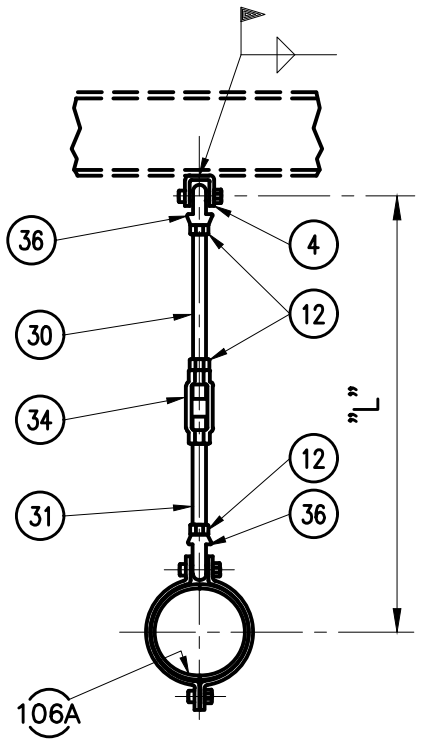
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
31	MACHINE THREADED ROD, (R&L) NO. 253
34	F.S. TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 230
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
10"	2'-11"
12"	3'-0"
14"	3'-1"
16"	3'-2"
18"	3'-6"
20"	3'-10"
24"	4'-2"
30"	5'-3"

NOTES

HF13

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HF13				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF13	REV: 0		

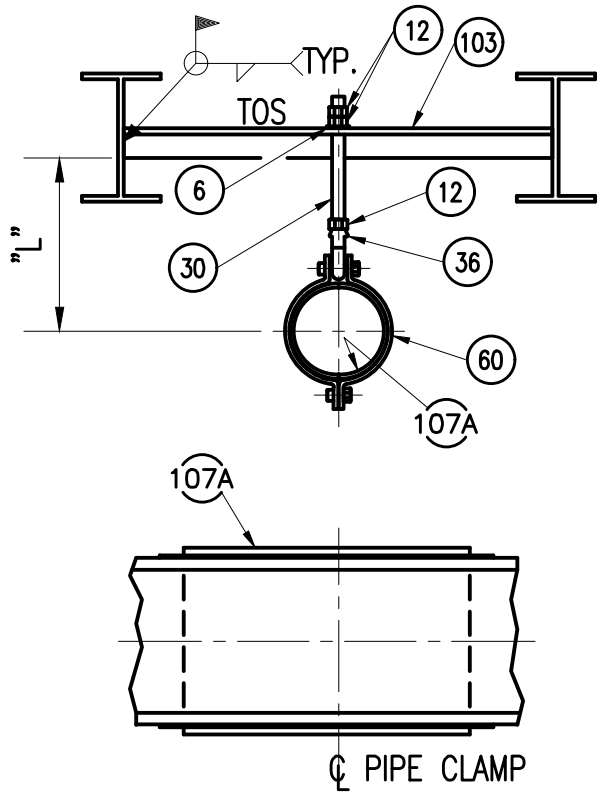
ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP NO. 212
103	FRAME IN STEEL
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.
2. SEE HANGER LOCATION DRAWING FOR FIG. 103 TYPE, SIZE AND SPAN.

MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	7"
4"	7"
6"	9"
8"	11"

HF30

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

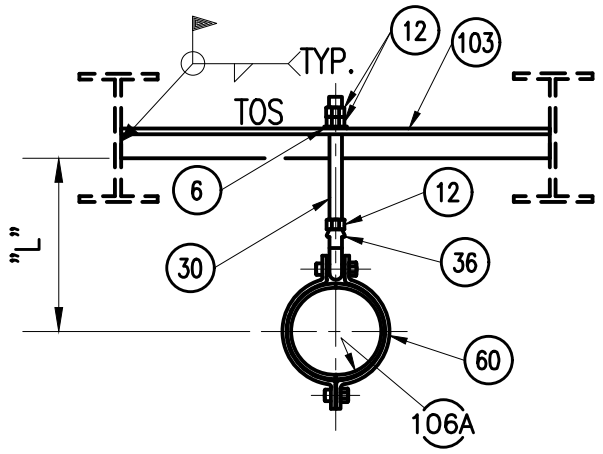
TITLE:	PIPE SUPPORT DETAIL – TYPE HF30				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF30	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	"L"
3"	7"
4"	7"
6"	9"
8"	11"

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NNUT, NO. 290
103	FRAME IN STEEL
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.
2. SEE HANGER LOCATION DRAWING FOR FIG. 103 TYPE, SIZE AND SPAN.

HF31

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

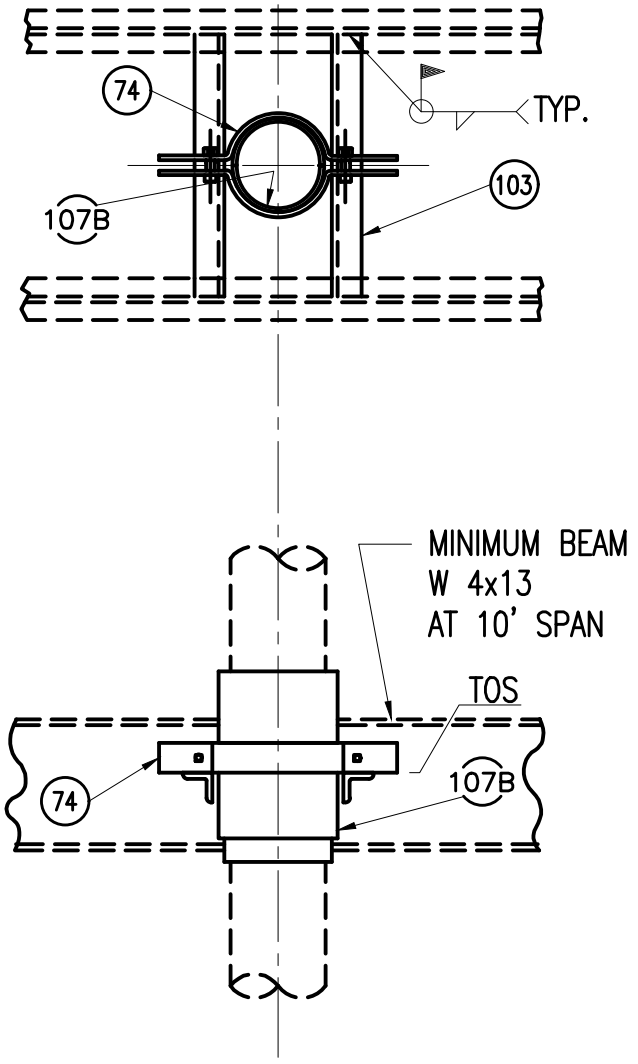
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF31	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
74	RISER CLAMP, NO. 261
103	FRAME IN STEEL
107B	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.
2. SEE HANGER LOCATION DRAWING FOR FIG. 103 TYPE, SIZE AND SPAN.

HF50

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

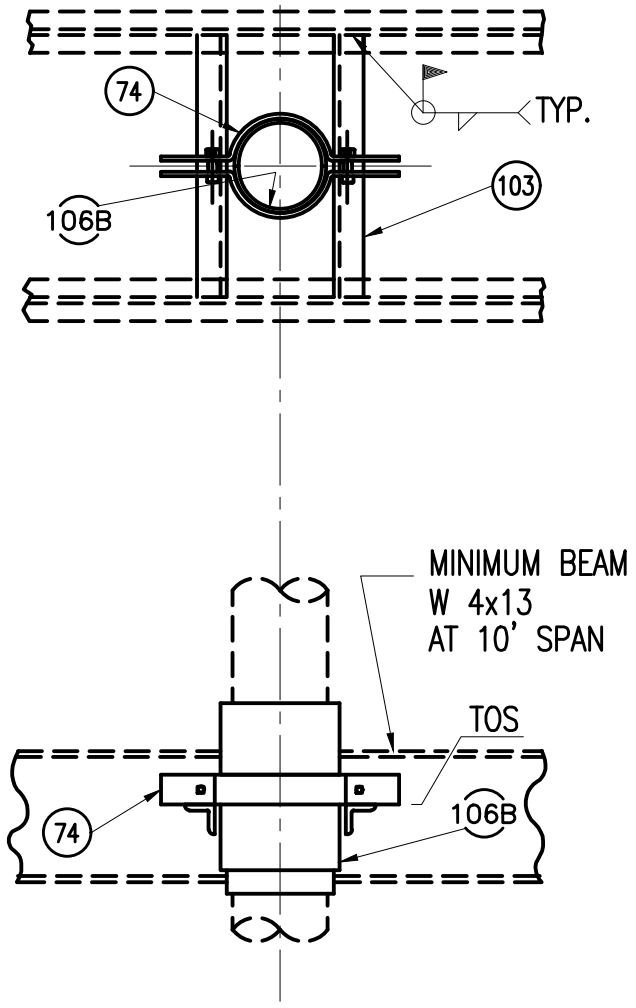
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF50	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
103	FRAME IN STEEL
106B	FRP PIPE SUPPORT WITH SADDLE AND CLAMP
74	RISER CLAMP, NO. 261

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.
2. SEE HANGER LOCATION DRAWING FOR FIG. 103 TYPE, SIZE AND SPAN.

HF51

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

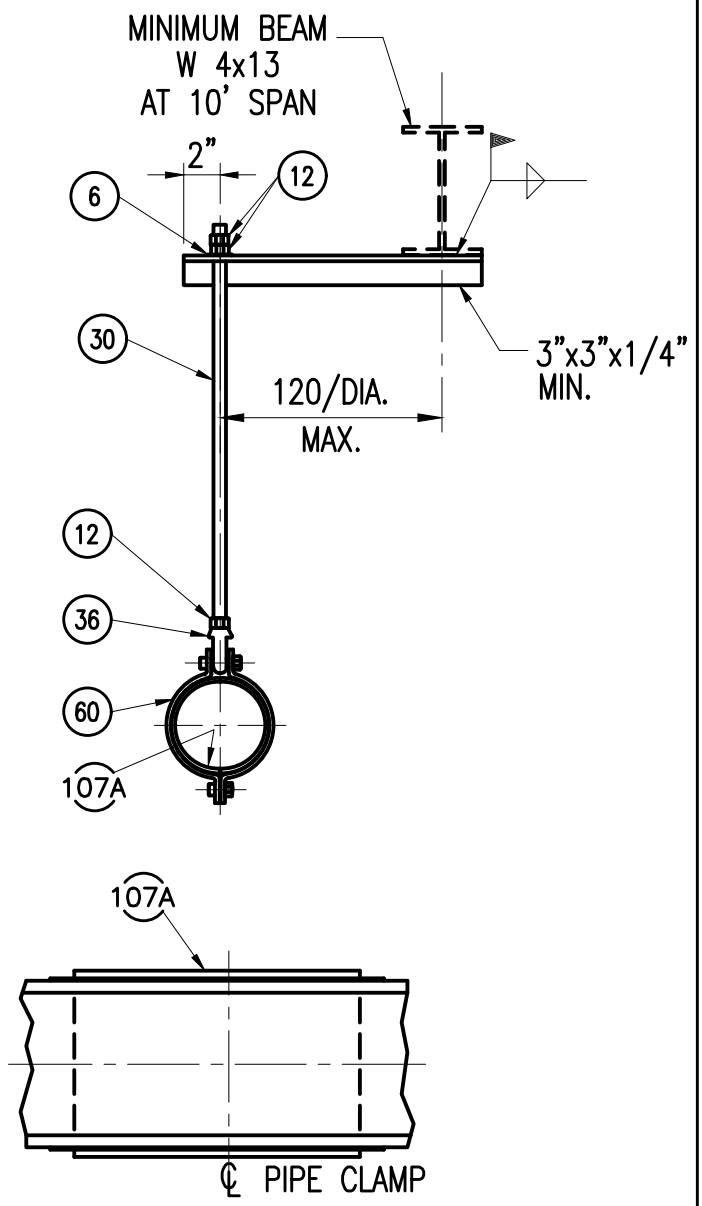
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF51	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.

HF60

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

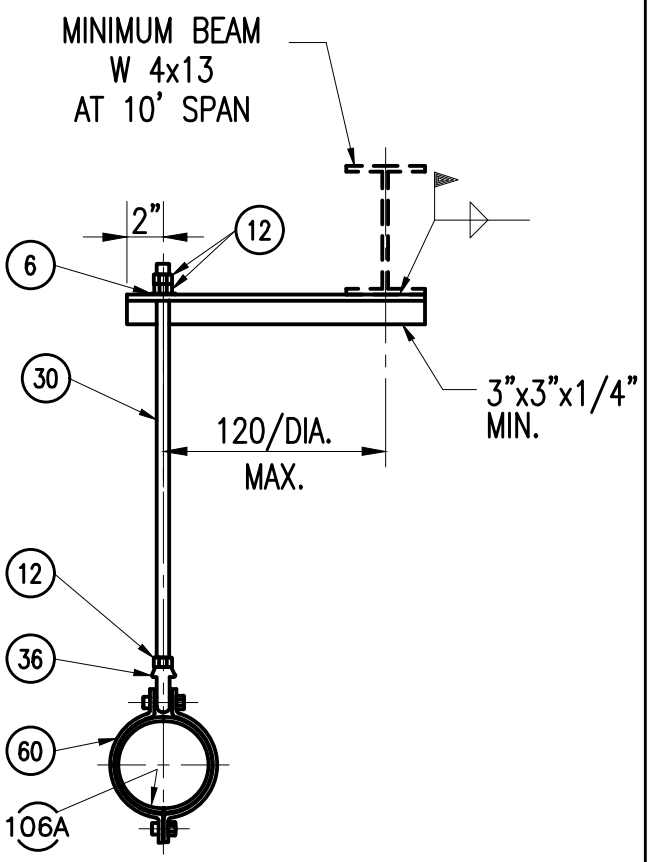
TITLE:	PIPE SUPPORT DETAIL – TYPE HF60				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF60	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
106A	FRP PIPE SUPPORT WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 8" DIAMETER.

HF61

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HF61				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF61	REV: 0		

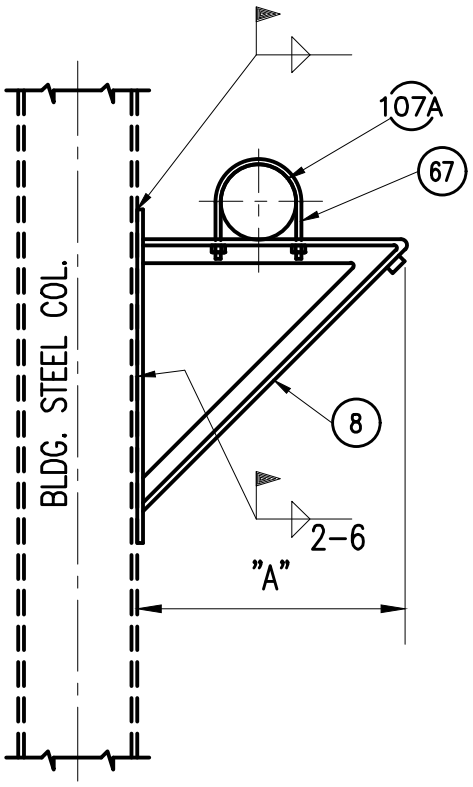
ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
"A"	12"	18"	24"	30"	36"	42"

PARTS LIST

NO.	DESCRIPTION
8	HEAVY WELDED STEEL BRACKET, NO. 199
67	STANDARD U-BOLT, NO. 137-3/4"
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 14" DIAMETER.

HF70

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

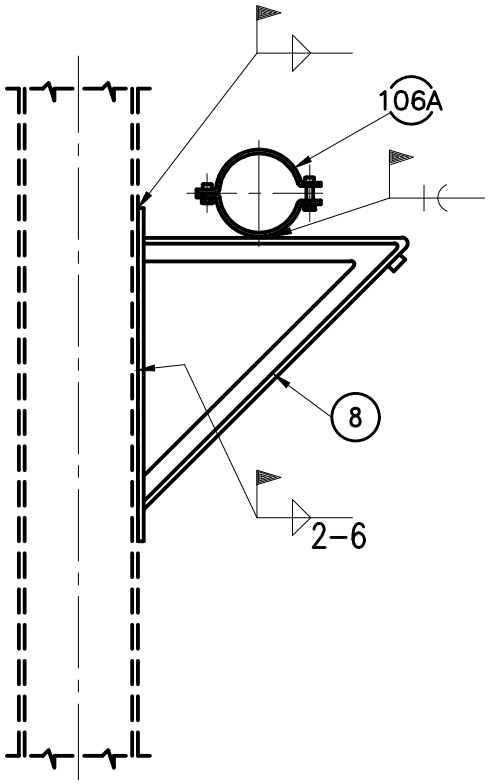
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF70	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
"A"	12"	18"	24"	30"	36"	42"

PARTS LIST

NO.	DESCRIPTION
8	HEAVY WELDED STEEL BRACKET, NO. 199
106A	FRP PIPE SUPPORT WITH SADDLE AND CLAMP

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS OVER 14" DIAMETER.

HF71

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HF71				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HF71	REV: 0		

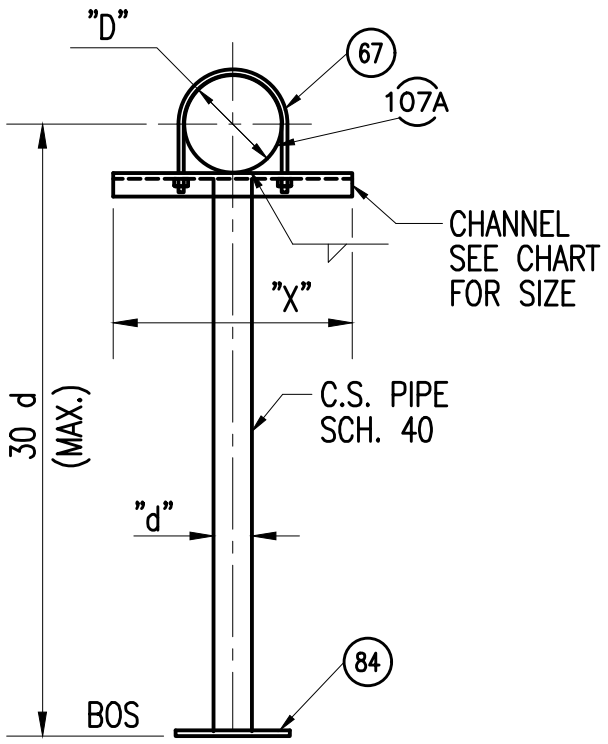
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



NPS "D"	"X"	CHANNEL SIZE	"d"
3" & 4"	1'-0"	C 3x6	2"
6" & 8"	1'-4"	C 4x7.25	3"
10" & 12"	1'-8"	C 6x10.5	4"
14" & 16"	2'-0"	C 8x11.5	6"
18" & 20"	2'-4"	C 10x20	8"

PARTS LIST

NO.	DESCRIPTION
67	STANDARD U-BOLT, NO. 137
84	C.S. BASE PLATE
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

HJ01

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

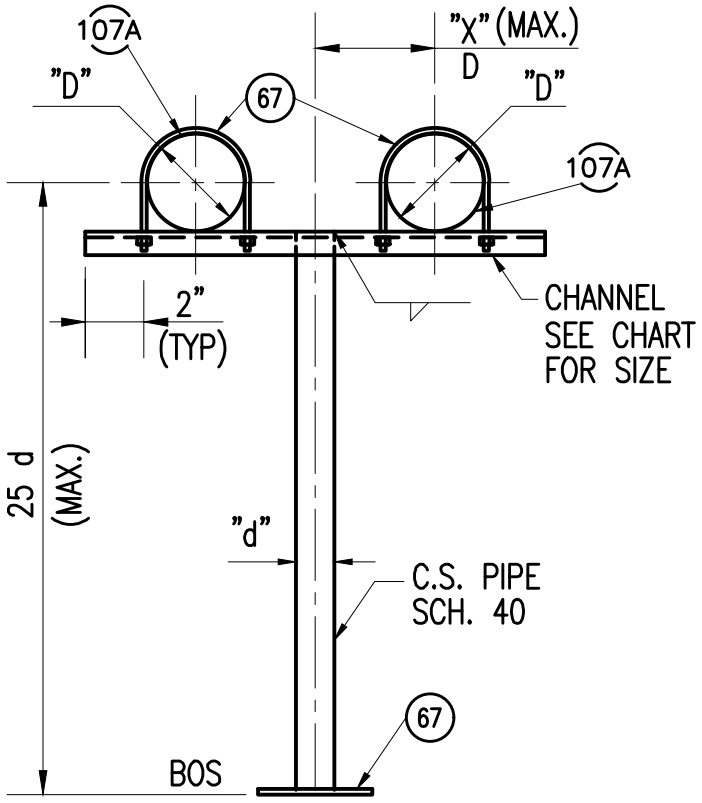
TITLE:	PIPE SUPPORT DETAIL - TYPE HJ01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HJ01	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



NPS "D"	"X"	CHANNEL SIZE	"d"
3" & 4"	120	C 3x6	2"
6" & 8"	120	C 4x7.25	3"
10" & 12"	200	C 6x10.5	4"
14" & 16"	300	C 8x11.5	6"
18" & 20"	350	C 10x20	8"

PARTS LIST

NO.	DESCRIPTION
67	STANDARD U-BOLT, NO.137
84	C.S. BASE PLATE
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

HJ03

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HJ03				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HJ03	REV: 0		

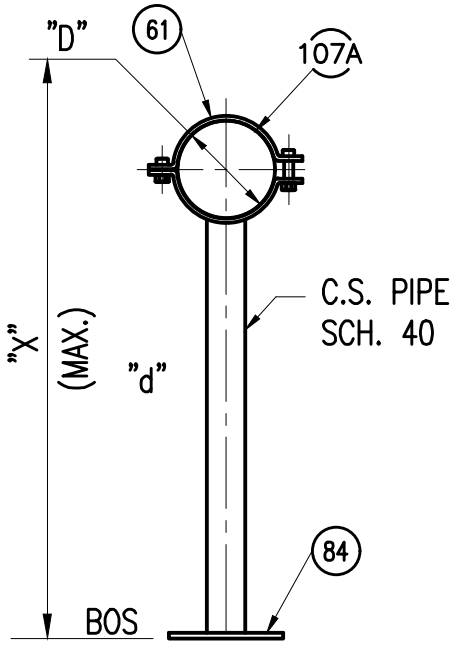
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



NPS "D"	"X"	"d"
4"	5'-6"	2"
6" & 8"	5'-0"	3"
10" & 12"	4'-6"	3"
14" & 16"	4'-0"	4"
18" & 20"	3'-6"	6"

PARTS LIST

NO.	DESCRIPTION
61	HEAVY PIPE CLAMP, NO. 216
84	C.S. BASE PLATE
107A	FRP PIPE BUILD-UP WITH SADDLE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

HJ10

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

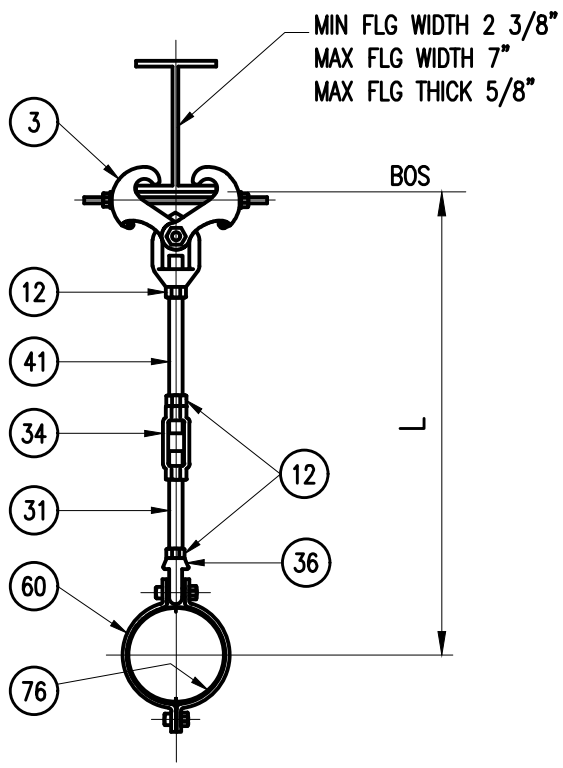
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HJ10	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-3"
4"	2'-4"
6"	2'-6"
8"	2'-8"
10"	2'-11"
12"	3'-0"
14"	3'-2"

HS01

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
60	SINGLE BOLT PIPE CLAMP, NO. 212
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 14" DIA.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HS01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS01	REV: 0		

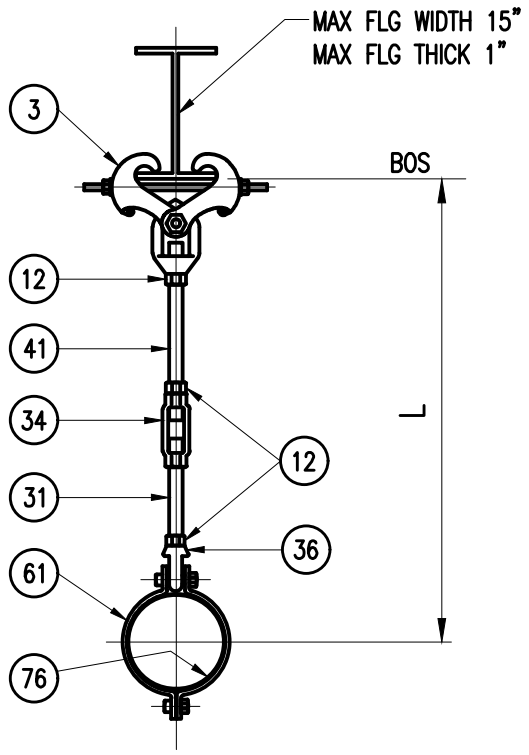
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
16"	3'-3"
18"	3'-7"
20"	3'-9"
24"	4'-2"

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 24" DIA.

HS02

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS02				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS02	REV: 0		

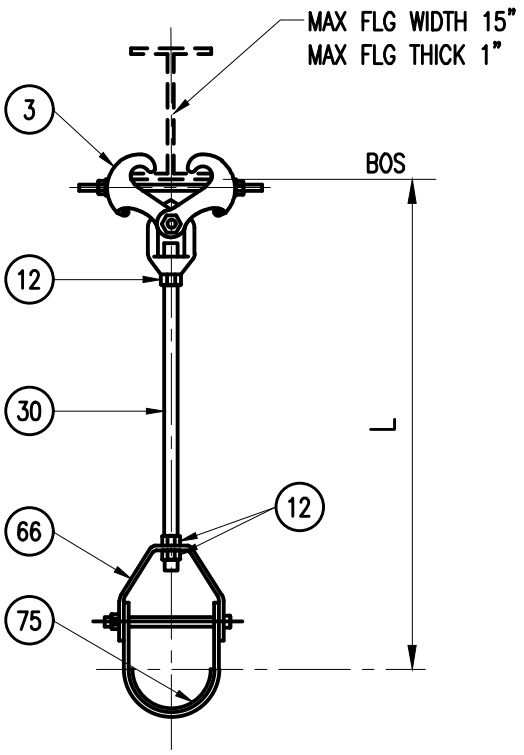
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	1'-2"
4"	1'-3"
6"	1'-5"
8"	1'-7"
10"	1'-9"
12"	1'-11"
14"	2'-1"
16"	2'-3"
18"	2'-5"

HS05

PARTS LIST

NO.	DESCRIPTION
3	FS BEAM CLAMP, NO. 292
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS, NO. 260
75	180° PIPE SADDLE (CENTERED ON CLEVIS)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 18" DIA.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

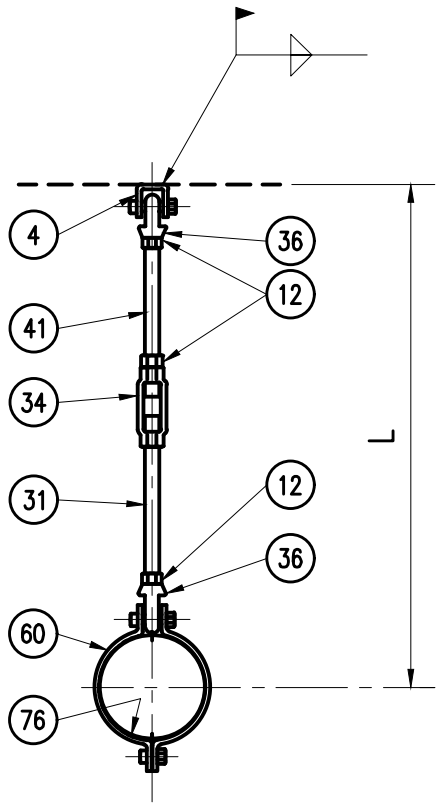
TITLE:	PIPE SUPPORT DETAIL – TYPE HS05				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS05	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-2"
4"	2'-4"
6"	2'-5"
8"	2'-9"
10"	2'-11"
12"	3'-0"
14"	3'-1"

HS10

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
60	SINGLE BOLT PIPE CLAMP, NO. 212
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 14" DIAMETER.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS10				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS10	REV: 0		

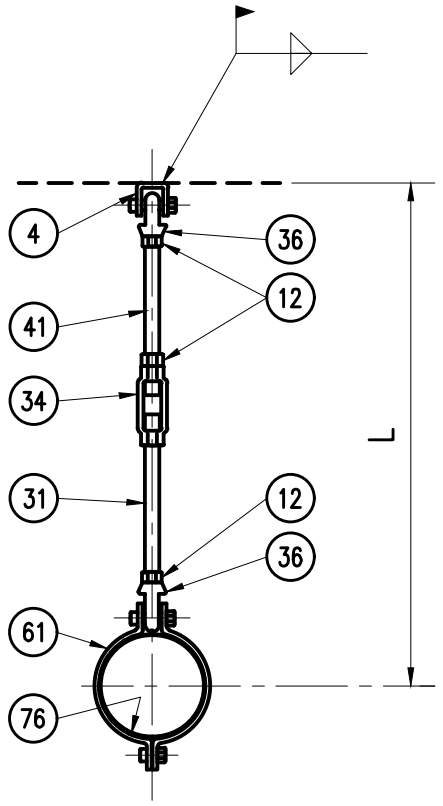
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
16"	3'-2"
18"	3'-6"
20"	3'-10"
24"	4'-2"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 24" DIAMETER.

HS11

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HS11				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: M. TATUM	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS11	REV: 0		

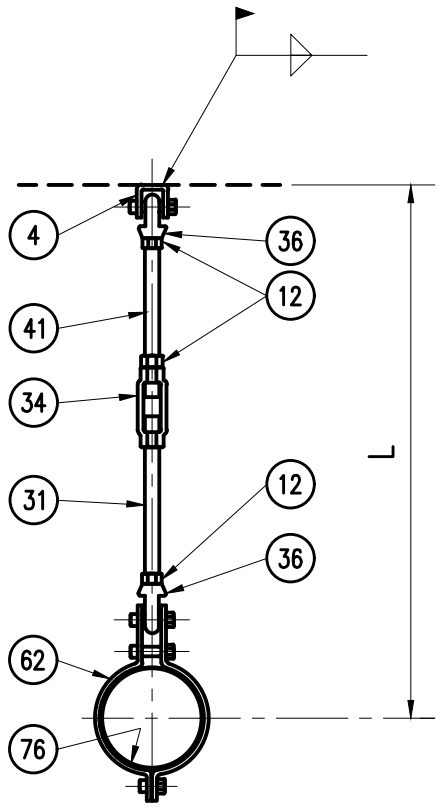
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	2'-5"
4"	2'-7"
6"	2'-9"
8"	2'-10"
10"	2'-11"
12"	3'-0"
14"	3'-3"
16"	3'-4"
18"	3'-5"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
62	DOUBLE BOLT PIPE CLAMP, NO. 295
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 18" DIAMETER.

HS12

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS12				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS12	REV: 0		

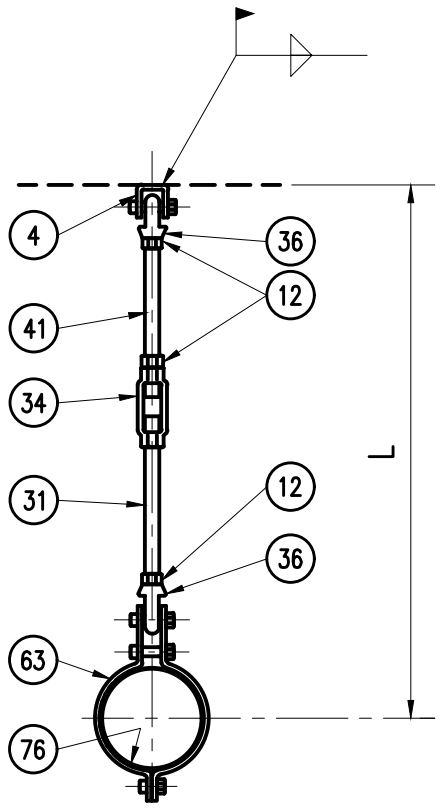
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
20	3'-8"
24"	4'-3"

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
31	MACHINE THREADED ROD (R&L), NO. 253
34	FS TURNBUCKLE, NO. 230
36	WELDLESS EYE NUT, NO. 290
41	CONTINUOUS THREADED ROD NO. 146
63	HEAVY DUTY DOUBLE BOLT PIPE CLAMP, NO. 295H
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 24" DIAMETER.

HS14

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HS14				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS14	REV: 0		

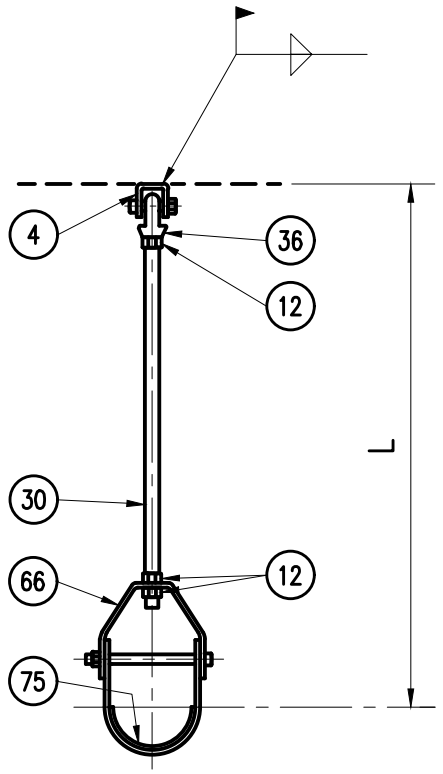
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	1'-1"
4"	1'-2"
6"	1'-3"
8"	1'-5"
10"	1'-6"
12"	1'-8"
14"	1'-9"
16"	1'-11"
18"	2'-1"

HS16

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
66	ADJUSTABLE CLEVIS HANGER, NO. 260
75	180° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 18" DIAMETER.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS16				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS16	REV: 0		

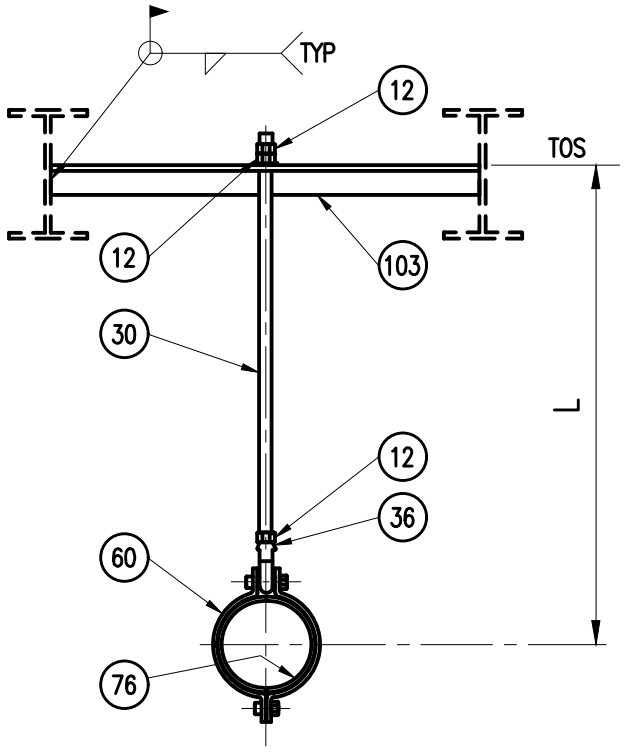
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	7"
4"	7"
6"	9"
8"	11"
10"	1'-1"
12"	1'-1"
14"	1'-3"

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212
76	360° PIPE SADDLE (CENTERED ON CLAMP)
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 14" DIA.
2. SEE DRAWING FOR TOS AND FIG 103.

HS30

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

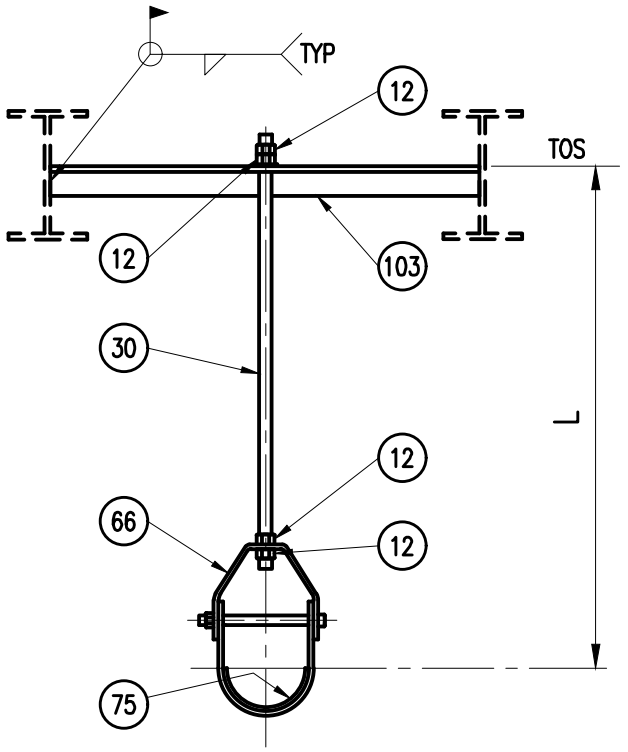
TITLE:	PIPE SUPPORT DETAIL – TYPE HS30				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS30	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE	
PIPE SIZE	L
3"	7"
4"	7"
6"	9"
8"	11"
10"	1'-0"
12"	1'-2"
14"	1'-3"
16"	1'-5"
18"	1'-7"

HS32

PARTS LIST

NO.	DESCRIPTION
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS HANGER, NO. 260
75	180° PIPE SADDLE (CENTERED ON CLEVIS)
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 18" DIA.
2. SEE DRAWING FOR TOS AND FIG 103.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

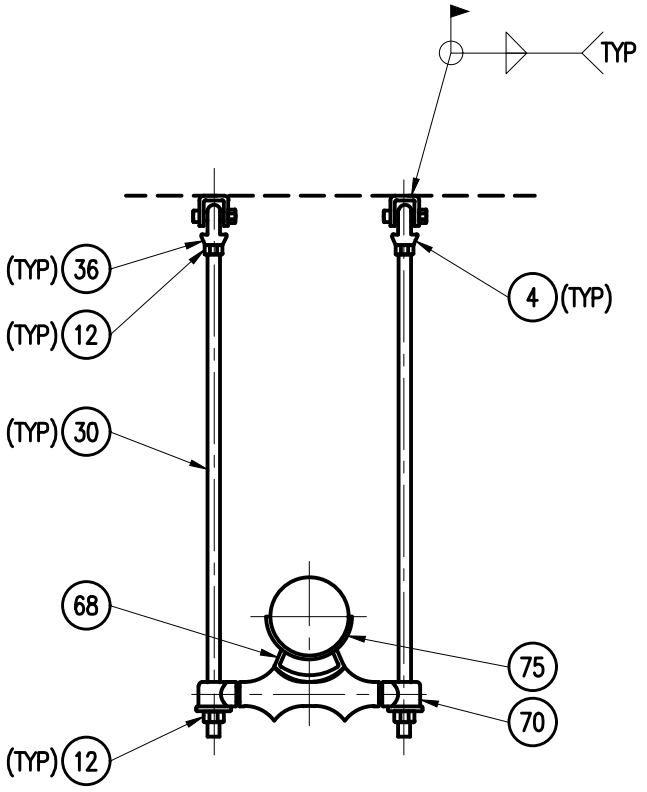
TITLE:	PIPE SUPPORT DETAIL – TYPE HS32				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS32	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



HS40

PARTS LIST

NO.	DESCRIPTION
4	WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166
70	SINGLE PIPE ROLL, NO. 171
75	180° PIPE SADDLE (CENTERED ON SADDLE)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HS40				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS40	REV: 0		

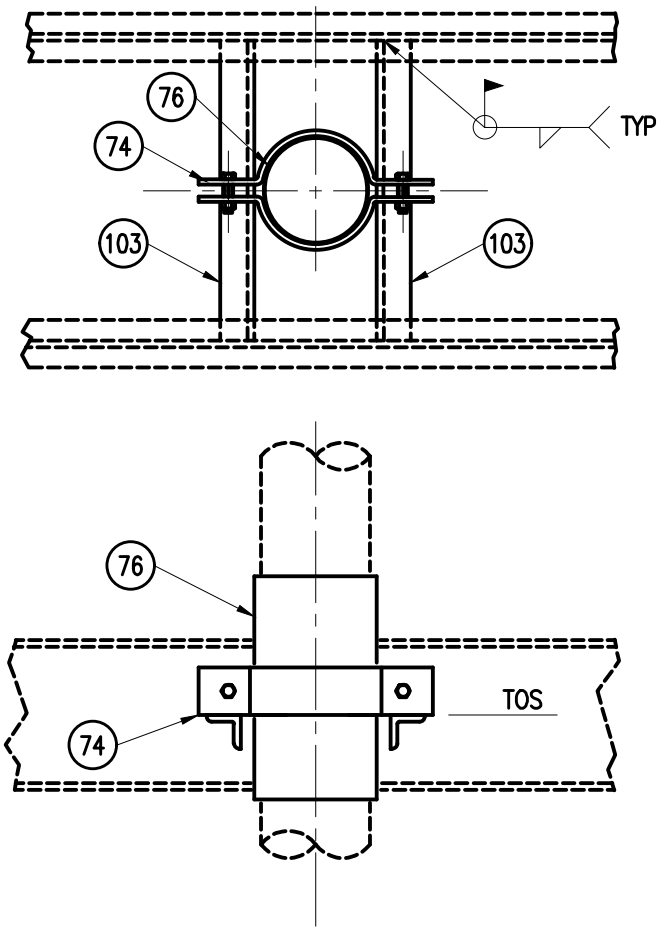
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
74	RISER CLAMP, NO. 261
76	360° PIPE SADDLE (CENTERED ON CLAMP)
103	FRAME IN STEEL

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. SEE DRAWING FOR TOS AND FIG 103.

HS50

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

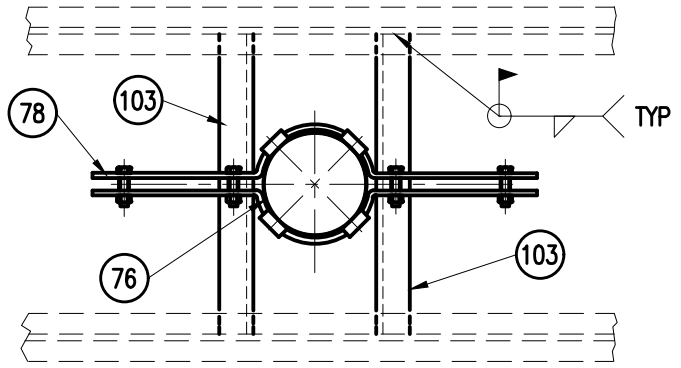
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS50	REV: 0		

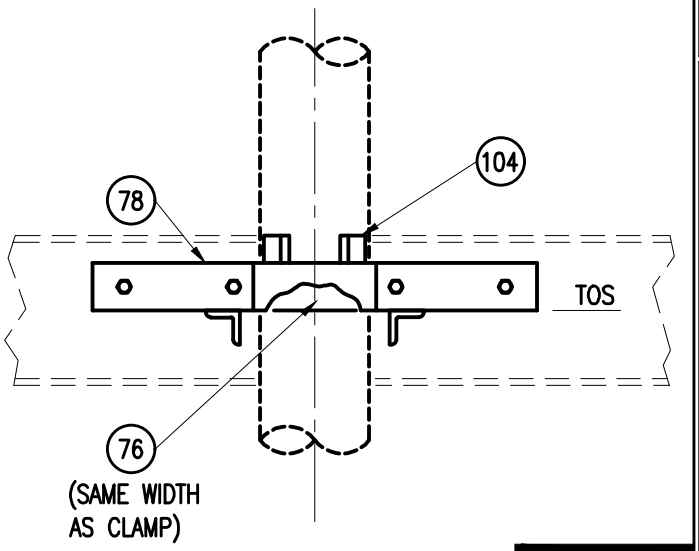
ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.





HS51

PARTS LIST

NO.	DESCRIPTION
76	360° PIPE SADDLE (CENTERED ON CLAMP)
78	RISER CLAMP, NO. 40
103	FRAME IN STEEL
104	RISER SHEAR LUG

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 24" DIAMETER.
2. SEE DRAWING FOR TOS AND FIG 103.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS51				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS51	REV: 0		

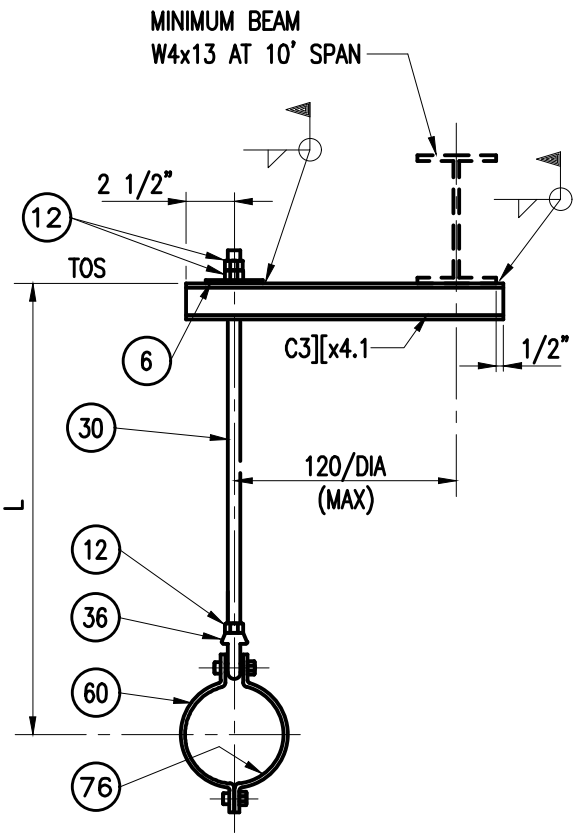
ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1040	7"
4"	1040	7"
6"	1615	9"
8"	1615	11"

HS60

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDNESS EYE NUT, NO. 290
60	SINGLE BOLT PIPE CLAMP, NO. 212
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

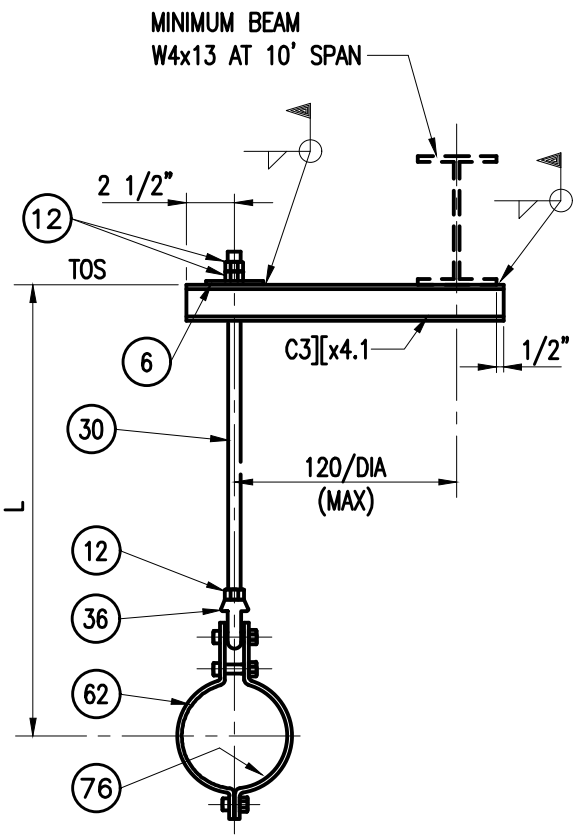
TITLE:	PIPE SUPPORT DETAIL – TYPE HS60				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS60	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1350	10"
4"	2160	11"
6"	2865	1'-1"
8"	2865	1'-3"

HS61

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDNESS EYE NUT, NO. 290
62	DOUBLE BOLT PIPE CLAMP, NO. 295
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

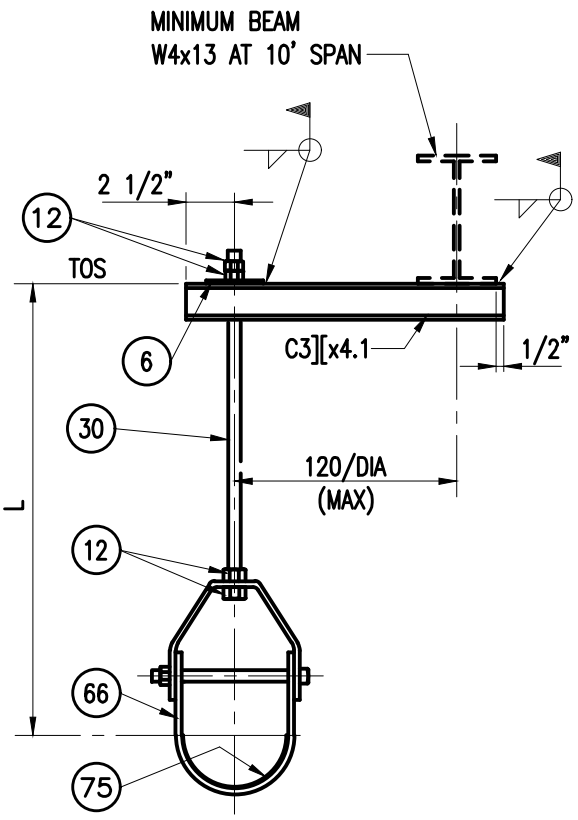
TITLE:	PIPE SUPPORT DETAIL – TYPE HS61				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS61	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



MINIMUM DISTANCE TABLE		
PIPE SIZE	MAX LOAD (LB)	L
3"	1350	10"
4"	1430	11"
6"	1940	1'-0"
8"	2000	1'-2"

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
66	ADJUSTABLE CLEVIS HANGER, NO. 260
75	180° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIAMETER.
2. CHECK EXISTING STEEL FOR MOMENT CAPACITY.
3. SEE DRAWING FOR TOS.
4. CHANNEL GAP IS ROD DIAMETER + 1/8".
5. LOADS MUST BE INDIVIDUALLY CALCULATED AND MUST NOT EXCEED THE MAXIMUM LOADS LISTED.

HS62

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

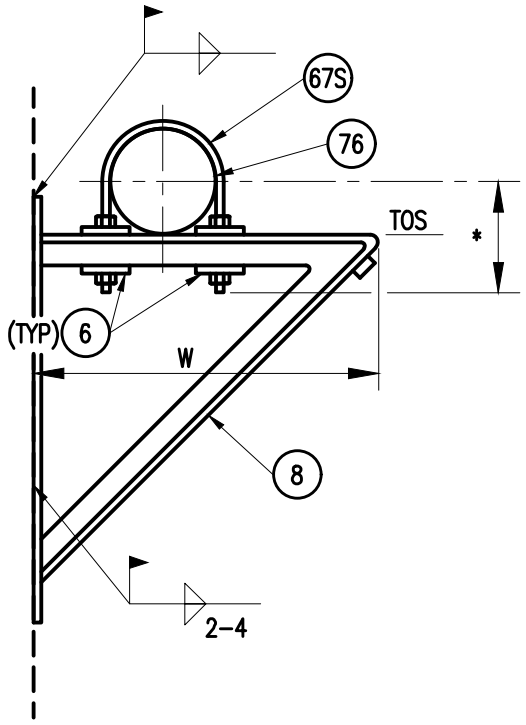
TITLE:	PIPE SUPPORT DETAIL – TYPE HS62				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS62	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

HS70

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
7	MEDIUM WELDED STEEL BRACKET, NO. 195
67S	SPECIAL U-BOLT, NO. 137S
76	360° PIPE SADDLE (CENTERED ON U-BOLT)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 16" DIA.
2. * TO BE DETERMINED BY CONTRACTOR
3. SEE DRAWING FOR "W" AND TOS.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

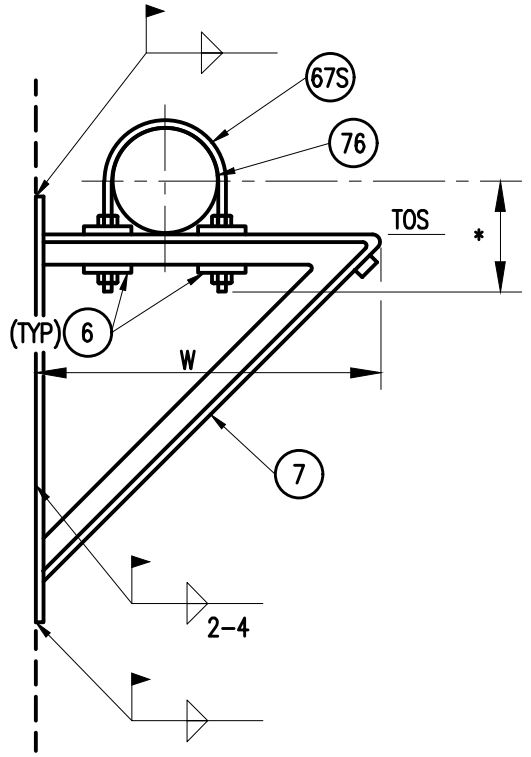
TITLE:	PIPE SUPPORT DETAIL - TYPE HS70				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS70	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2
W	12"	18"	24"

HS73

PARTS LIST

NO.	DESCRIPTION
6	STEEL PLATE WASHER, NO. 60
7	MEDIUM WELDED STEEL BRACKET, NO. 195
67S	SPECIAL U-BOLT, NO. 137S
76	360° PIPE SADDLE (CENTERED ON U-BOLT)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 8" DIA.
2. * TO BE DETERMINED BY CONTRACTOR
3. SEE DRAWING FOR "W" AND TOS.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS73				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS73	REV: 0		

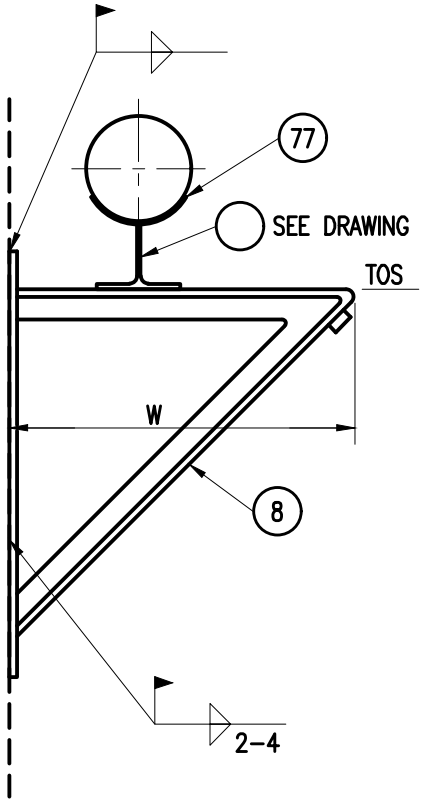
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

PARTS LIST

NO.	DESCRIPTION
8	HEAVY WELDED STEEL BRACKET, NO. 199
77	120° PIPE SADDLE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE FOR PIPE LARGER THAN 16" DIA.
2. SEE DRAWING FOR "W", TOS AND INSULATION SHOE.

HS75

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS75				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS75	REV: 0		

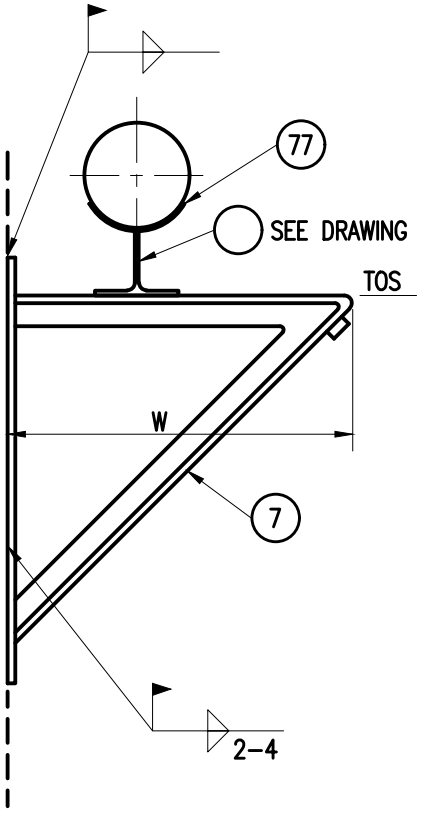
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



BRACKET NO.	0	1	2	3	4	5
W	12"	18"	24"	30"	36"	42"

PARTS LIST

NO.	DESCRIPTION
7	HEAVY WELDED STEEL BRACKET, NO. 195
77	120° PIPE SADDLE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. DO NOT USE WHEN PIPE IS LARGER THAN 10" DIA.
2. SEE DRAWING FOR "W", TOS, AND INSULATION SHOE.

HS76

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS76				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS76	REV: 0		

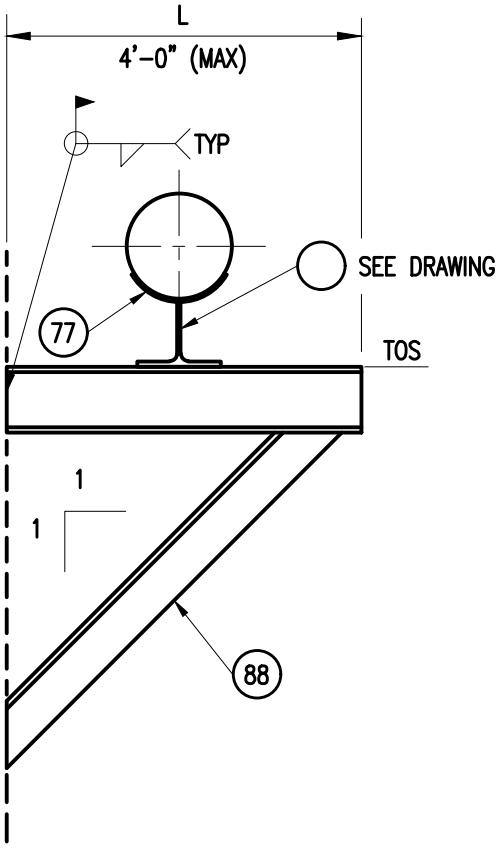
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PARTS LIST

NO.	DESCRIPTION
77	120° PIPE SADDLE
88	FABRICATED STEEL BRACKET
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS, FIG 88, "L", & INSULATION SHOE.

HS78

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

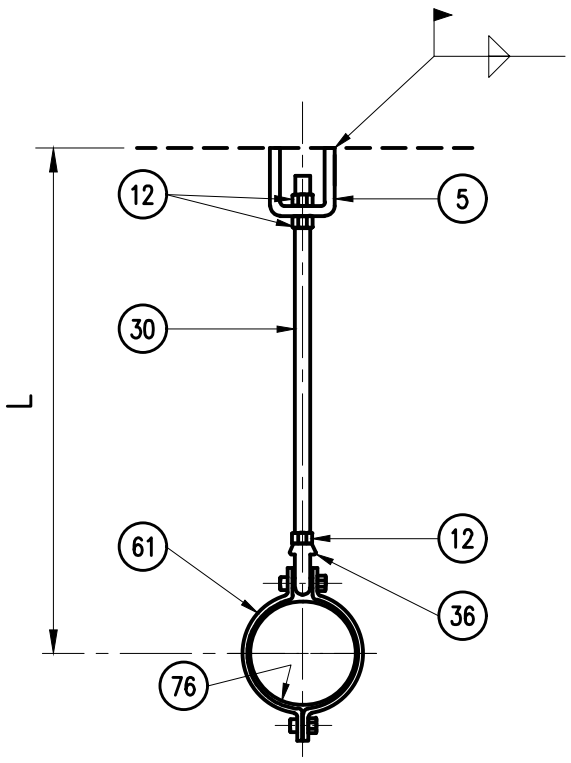
TITLE:	PIPE SUPPORT DETAIL – TYPE HS78				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS78	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



DISTANCE TABLES		
PIPE SIZE	MIN L DIM	MAX L DIM
3"	10 1/2"	2'-1"
4"	11 1/4"	2'-3"
6"	1'-1 1/4"	2'-4"
8"	1'-2 1/4"	2'-8"
10"	1'-5"	2'-10"
12"	1'-6 1/2"	2'-11"
14"	1'-8 3/4"	3'-0"
16"	1'-9 3/4"	3'-1"
18"	2'-1 1/4"	3'-5"
20"	2'-4 1/2"	3'-9"

PARTS LIST

NO.	DESCRIPTION
5	INVERTED WELDED BEAM ATTACHMENT, NO. 66
12	HEAVY SERIES HEX NUT
30	MACHINE THREADED ROD, NO. 140
36	WELDLESS EYE NUT, NO. 290
61	HEAVY DUTY SINGLE BOLT PIPE CLAMP, NO. 216
76	360° PIPE SADDLE (CENTERED ON CLAMP)

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. USE ONLY FOR PIPE LINES WITH NO MOVEMENT AND NOT SUBJECT TO HAMMER.

HS79

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

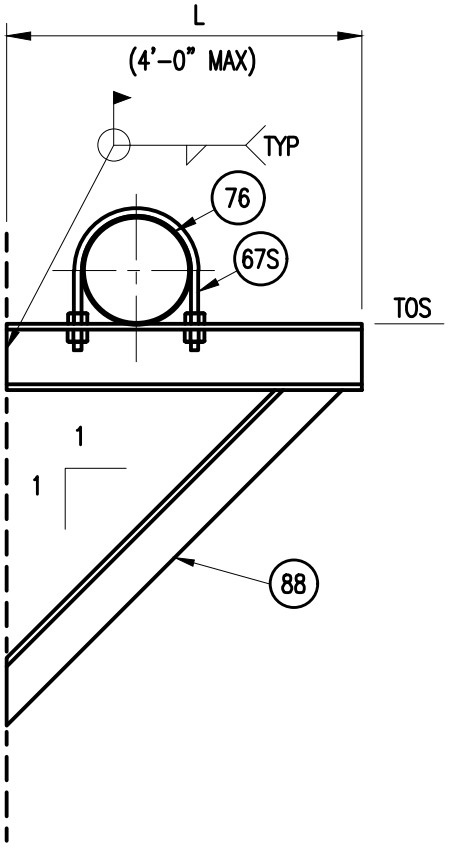
TITLE:	PIPE SUPPORT DETAIL – TYPE HS79				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS79	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



HS88

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
76	360° PIPE SADDLE (CENTERED ON U-BOLT)
88	FABRICATED STEEL BRACKET

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR FIG 88, "L" AND TOS.

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL – TYPE HS88				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HS88	REV: 0		

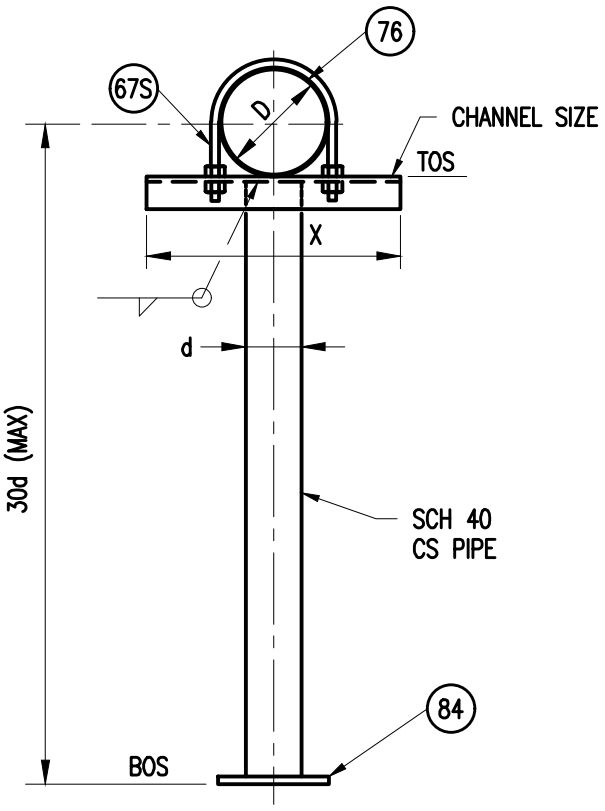
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	12"	C6x10.5	2"
6"& 8"	16"	C6x10.5	3"
10"& 12"	20"	C7x12.25	4"
14"& 16"	24"	C9x13.4	6"
18"& 20"	28"	C12x25	8"

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
76	360° PIPE SADDLE (CENTERED ON U-BOLT)
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR BOS, TOS AND FIG 67S.
2. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

HT01

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

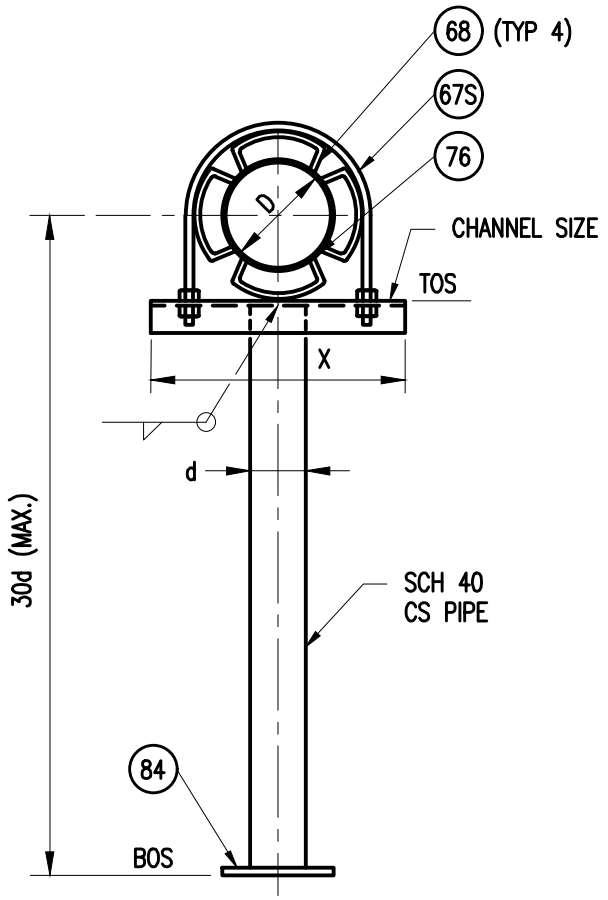
TITLE:	PIPE SUPPORT DETAIL – TYPE HT01				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT01	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	20"	C6x10.5	2"
6"& 8"	24"	C6x10.5	3"
10"& 12"	28"	C7x12.25	4"
14"& 16"	32"	C9x13.4	6"
18"& 20"	36"	C12x25	8"

HT02

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
68	PIPE COVERING PROTECTION SADDLE, NO. 160-166
76	360° PIPE SADDLE (CENTERED ON U-BOLT)
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 67S.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

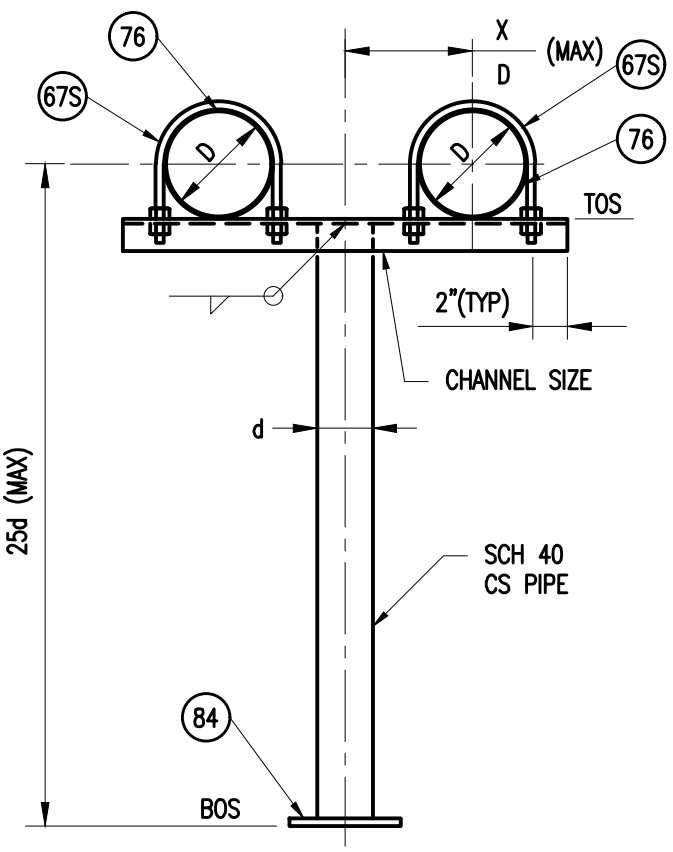
TITLE:	PIPE SUPPORT DETAIL - TYPE HT02				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT02	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	120"	C6x10.5	2"
6"& 8"	120"	C6x10.5	3"
10"& 12"	200"	C7x12.25	4"
14"& 16"	300"	C9x13.4	6"
18"& 20"	350"	C12x25	8"

HT03

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
76	360° PIPE SADDLE (CENTERED ON U-BOLT)
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 67S.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

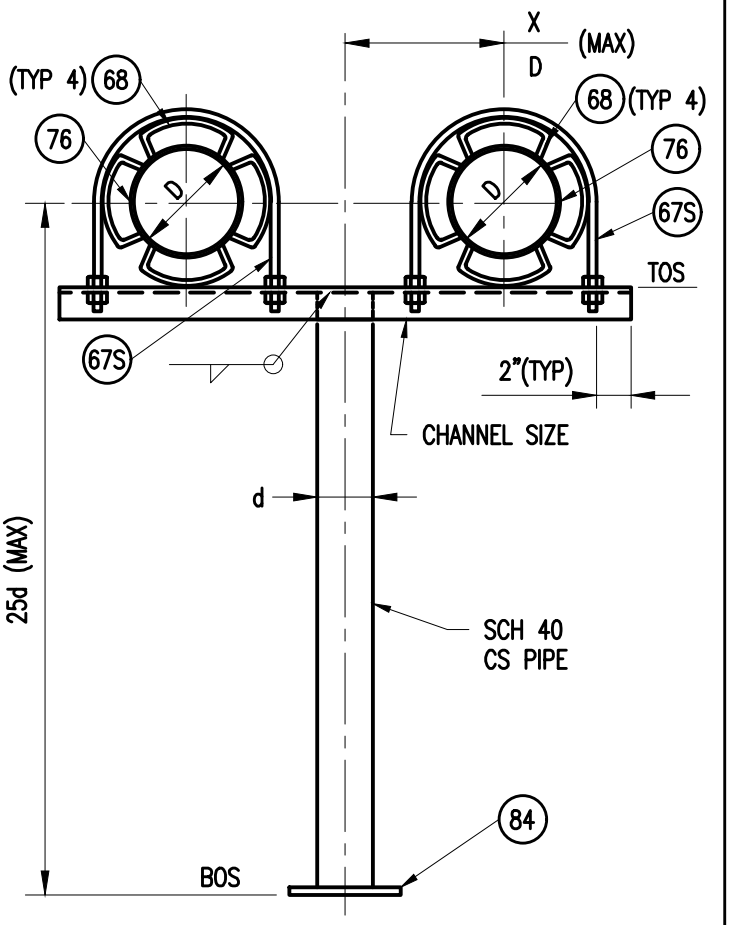
TITLE:	PIPE SUPPORT DETAIL – TYPE HT03				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT03	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	120	C6x10.5	2"
6"& 8"	120	C6x10.5	3"
10"& 12"	200	C7x12.25	4"
14"& 16"	300	C9x13.4	6"
18"& 20"	350	C12x25	8"

HT04

PARTS LIST

NO.	DESCRIPTION
67S	SPECIAL U-BOLT, NO. 137S
68	PIPE COVERING PROTECTION SADDLE, NO.160-166
76	360° PIPE SADDLE (CENTERED ON U-BOLT)
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND FIG 67S.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

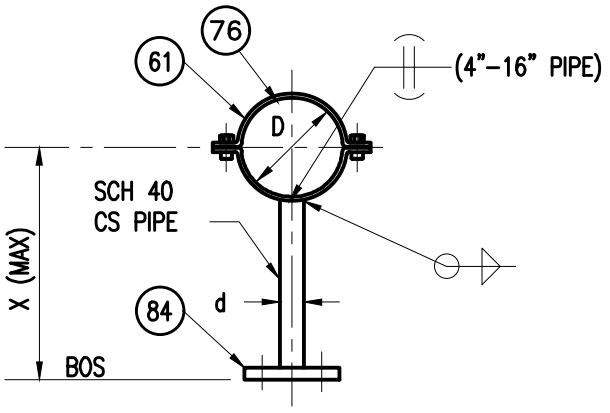
TITLE:	PIPE SUPPORT DETAIL - TYPE HT04				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT04	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d
4"	5'–6"	2"
6" & 8"	5'–0"	3"
10" & 12"	4'–6"	3"
14" & 16"	4'–0"	4"
18"– 24"	3'–6"	4"

PARTS LIST

NO.	DESCRIPTION
61	HEAVY DUTY PIPE CLAMP, NO. 216
76	360° PIPE SADDEL (CENTERED ON CLAMP)
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD–039–001

NOTES

1. BOS IS TOC PLUS 1 1/2" GROUT.

HT10

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

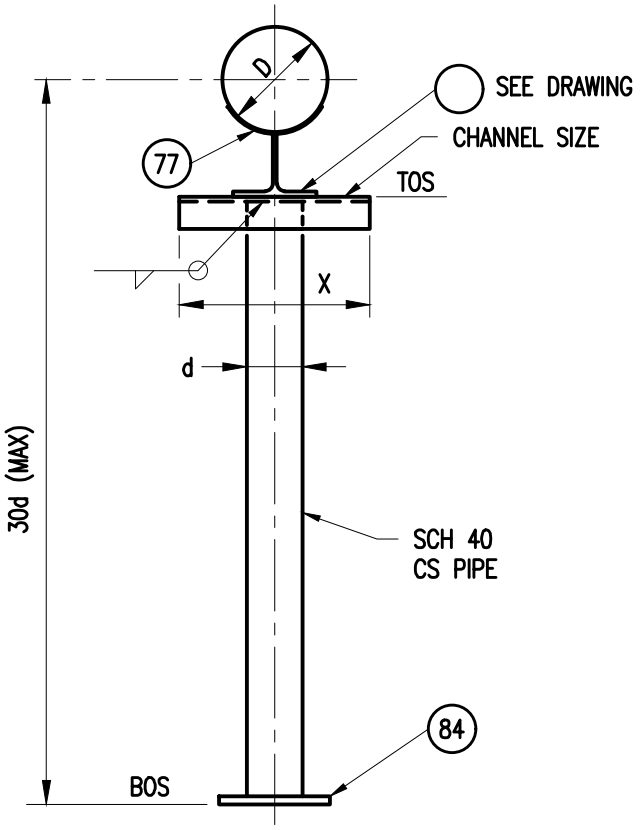
TITLE:	PIPE SUPPORT DETAIL – TYPE HT10				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD–039–HT10	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	18"	C6x10.5	2"
6"& 8"	18"	C6x10.5	3"
10"& 12"	18"	C7x12.25	4"
14"& 16"	18"	C9x13.4	6"
18"& 20"	18"	C12x25	8"

HT11

PARTS LIST

NO.	DESCRIPTION
77	120° PIPE SADDLE
84	CS BASE PLATE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND INSULATION SHOE.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION B.O.S.	ELEVATION T.O.S.	PIPE LINE NUMBER	SUPPORT REF. DRAWING

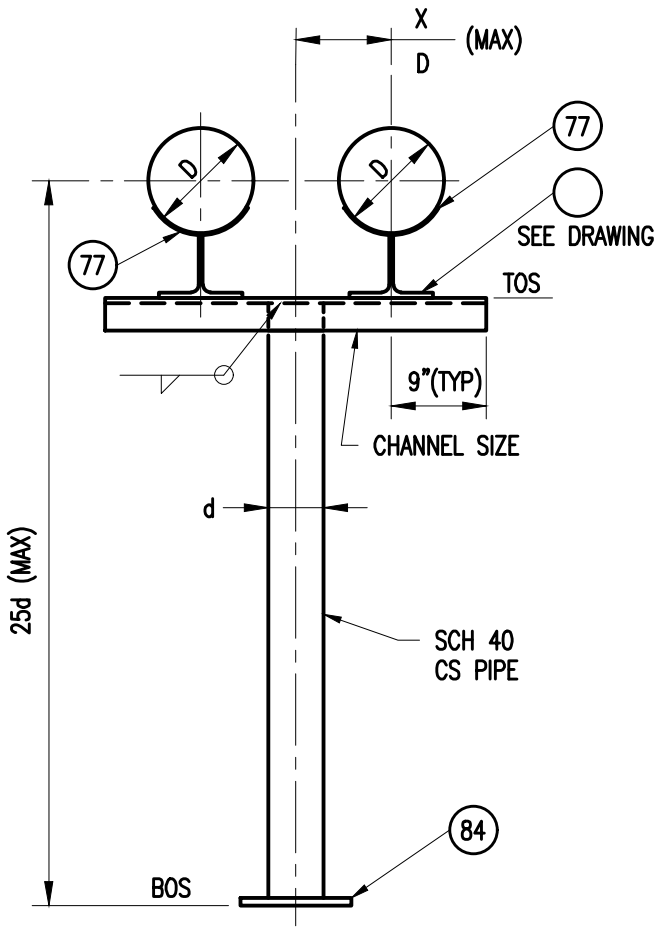
TITLE:	PIPE SUPPORT DETAIL – TYPE HT11				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT11	REV: 0		

ANSI A–8.5x11

ENG–STD–XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	CHANNEL SIZE	d
3"& 4"	120	C6x10.5	2"
6"& 8"	120	C6x10.5	3"
10"& 12"	200	C7x12.25	4"
14"& 16"	300	C9x13.4	6"
18"& 20"	350	C12x25	8"

HT12

PARTS LIST

NO.	DESCRIPTION
77	120° PIPE SADDLE
84	CS BASE PLATE
VAR	INSULATION SHOE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. SEE DRAWING FOR TOS AND INSULATION SHOE.
2. BOS IS TOC PLUS 1 1/2" GROUT.
3. FOR HEIGHTS OF 8'-0" OR MORE ABOVE BOS, CONSULT STRUCTURAL DEPARTMENT FOR VERIFICATION OF DESIGN.

PIPE SUPPORT DATA

NODE NUMBER | CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

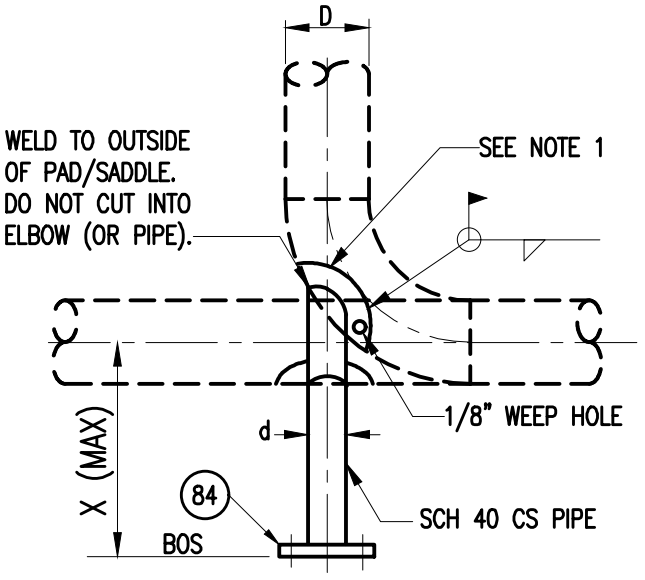
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DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT12	REV: 0		

ANSI A–8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d
3" & 4"	5'-6"	2"
6" & 8"	5'-0"	2"
10" & 12"	4'-6"	3"
14" & 16"	4'-0"	4"
18"- 24"	3'-6"	4"

PARTS LIST

NO.	DESCRIPTION
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. REINFORCING PLATE TO EXTEND 2" OUTSIDE OF STANCHION. USE SAME MATERIAL AND WALL THICKNESS AS PIPE.
2. BOS IS TOC PLUS 1 1/2" GROUT.

HT20

PIPE SUPPORT DATA

NODE NUMBER

CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HT20				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT20	REV: 0		

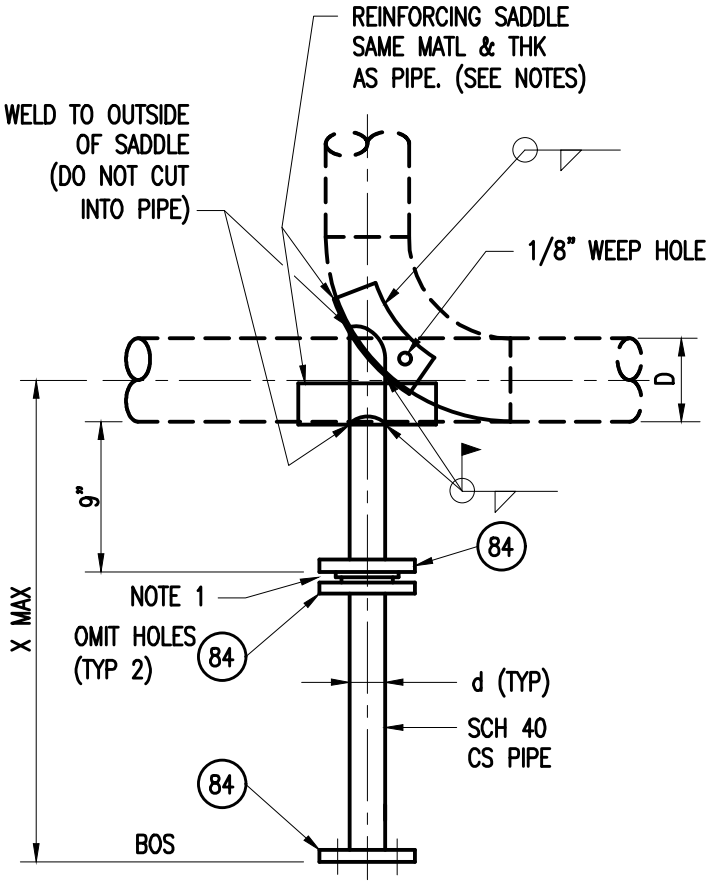
ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY)

ALTERNATE NUMBER

STANDARD DETAIL

wood.



PIPE SIZE D	X	d	MAX LOAD (LB)
3" & 4"	3'-0"	2"	470
6" & 8"	3'-6"	4"	1450
10" & 12"	4'-0"	6"	3100
14" & 16"	4'-6"	8"	4800
18"-24"	5'-0"	10"	11000

HT21

PARTS LIST

NO.	DESCRIPTION
84	CS BASE PLATE

ALL PART NUMBERS ARE WOOD FIGURE NUMBERS, SEE STANDARD TD-039-001

NOTES

1. FILLED TEFLON UPPER & LOWER SLIDE PLATES, TACK WELD TO ITEM 84.
2. USE SADDLE ON SCH 10S PIPE & LIGHTER. DO NOT USE ON SCH 40S AND HEAVIER.
3. REINFORCING SADDLE TO EXTEND A MINIMUM OF 2" OUTSIDE OF STANCHION.
4. BOS IS TOC PLUS 1 1/2" GROUT.

PIPE SUPPORT DATA

NODE NUMBER	CALCULATION NUMBER

PIPE	DIA. OF ROD	ELEV. ℄ OF PIPE	ELEVATION		PIPE LINE NUMBER	SUPPORT REF. DRAWING
			B.O.S.	T.O.S.		

TITLE:	PIPE SUPPORT DETAIL - TYPE HT21				
DATE: 15MAY20 (DDMMMYY)	DOCUMENT OWNER: PIPING DLT	CHECKED BY C. FORTUNE	PROJ APPR: T. SISTI	SHEET 1 OF 1	
PROJ NO.: GENERIC	PROJ NAME: CORPORATE	DOC NO.: TD-039-HT21	REV: 0		

ANSI A-8.5x11

ENG-STD-XXXXXX REVISION DATE (DDMMMYY) ALTERNATE NUMBER

Big Rivers
ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix H – Rev 2

Fire Protection Performance Specification

(No updates to any documents since Rev 1 Package)

Appendix	Document Number	Document Title	Document Revision
H	143993-ASA-DE4-SPC-1576	CLEAN-AGENT FIRE SUPPRESSION SYSTEMS - CONSTRUCTION SPECIFICATION	B

CONSTRUCTION SPECIFICATIONS

TITLE:	**CLEAN-AGENT FIRE SUPPRESSION SYSTEMS**	PROJECT DOC. NO.:	**143993-ASA-DE4-SPC-1576**	REV.	**B**

PROJECT NAME:	**DB Wilson FGD**	PROJECT NO.:	**245891**
CLIENT:	**Big Rivers Electric Company**	AREA NO.:	

APPROVAL STATUS							
PREPARED BY:	BL	**DATE**	06MAY21	**CHECKED BY:**	RGS	**DATE**	05MAY21
APPROVED BY:	EC	**DATE**	06MAY21	**APPROVED BY:**	JT	**DATE**	06MAY21
APPROVED BY:		**DATE**		**APPROVED BY:**		**DATE**	

REVISION STATUS						
REV	**ISSUED FOR**	**REVISED BY**	**CHECKED BY**	**APPROVAL**	**APPROVAL**	**DATE**
A	APPROVAL	BL	RGS	EC	JT	06MAY21
B	BID	BL	RGS	EC	JT	28MAY21

CLEAN-AGENT FIRE SUPPRESSION SYSTEMS

PART 1 - GENERAL

1.1 SYSTEM PERFORMANCE REQUIREMENTS

A. Design and obtain approval from authority having jurisdiction for gaseous clean agent fire suppression systems specified.

B. Minimum Pipe Sizes: Sizes as required for total suppression volume and minimum release from designed nozzles based on the design agent cylinder pressure, following manufacturer recommendations and NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems.

C. Components and Installation: Capable of producing piping systems with the minimum working pressure ratings compatible with agent cylinder pressure ratings except where indicated otherwise.

D. Total flooding system shall consist of the following agent storage containers: 3M Novec 1230.

E. The discharge time required to achieve 95% of the minimum design concentration for flame extinguishment shall not exceed 10 seconds regardless of piping distance to the hazard being protected.

F. The minimum design concentration shall be maintained for a specified period of time to allow effective emergency action by trained personnel. A level 1 certification in room integrity testing, provided by a recognized manufacturer of room integrity testing equipment is required.

G. Fire suppression contractor shall coordinate any required interlock from the clean agent suppression system with any local / area fire alarm system or annunciator.

1.2 SUBMITTALS

A. Provide product data for fire suppression system components. Include the following:
1. Piping.
2. Specialty valves, accessories, and devices.
3. Alarm devices. Include electrical data.
4. Agent cylinders including agent gas type (Novec 1230), weight/volume, dimensions, pressure and accessories.
5. Nozzles and escutcheons.

B. Suppression system drawings, identified as "working plans" and prepared according to NFPA 2001. Include system hydraulic calculations where applicable.

C. Test reports and certificates as described in NFPA 2001.

D. Maintenance data for each type of fire protection specialty specified.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL Fire Protection Equipment Directory and FM Approval Guide and that conform to other requirements indicated.

B. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

C. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.
1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

D. Comply with requirements of authority having jurisdiction for submittals, approvals, materials, hose threads, installation, inspections, and testing.

E. Installer's Qualifications: Firms qualified to install and alter fire suppression piping, equipment, specialties, and accessories, and repair and service equipment. A qualified firm is one that is experienced (minimum of 5 previous projects similar in size and scope to this Project) in such work, familiar with precautions required, and in compliance with the requirements of the authority having jurisdiction. Firm shall be fully licensed and shall carry all credentials as required for detailed design, fabrication and installation of automatic clean agent suppression systems. Submit evidence of qualifications upon request.

F. Codes and Standards: Equipment, specialties, accessories, installation, and testing complying with the following:
1. 2015 International Fire Code
2. 2018 Kentucky Building Code (2015 IBC)
3. NFPA 2001 ‘Standard on Clean Agent Fire Extinguishing Systems’
4. NFPA 70 ‘National Electrical Code’
5. NFPA 72 ‘Fire Alarm Systems’
6. FMDS 5-40 ‘Fire Alarm Systems’

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. System Design, Nozzles, Specialty Valves and Releasing Panels:

a. Viking Corp.
b. Tyco Sprinkler Corp.
c. Gem Sprinkler Co. Div., Sapphire Plus
d. Firetrace International.
e. United Fire Protection.
f. Fike Corporation.
g. Honeywell

2.2 PIPES AND TUBES

1. Distribution piping materials shall meet the physical and chemical characteristics compatible with the agent/gas and pressure such that its integrity under stress can be predicted with reliability. Special corrosion-resistant materials and coatings shall be required in severely corrosive atmospheres. The thickness of the piping shall be calculated in accordance with ASME B31.1.

2.3 PIPE AND TUBE FITTINGS

A. Fittings shall have a minimum rated working pressure equal to or greater than the minimum design working pressure for the clean agent being used, or as otherwise listed or approved.

B. Cast iron fittings shall not be used.

C. Class 150 fittings shall not be used.

D. All threads used in joints and fittings shall conform to ASME B1.20.1

2.4 FIRE PROTECTION SERVICE VALVES

A. All valves shall be listed or approved for the intended use.

B. All gaskets, O-rings, sealants and other valve components shall be constructed of materials that are compatible with the agent. Valves shall be protected against mechanical, chemical or other damage.

2.5 CONTROL EQUIPMENT (PANELS)

A. The control panel shall consist of a main microprocessor and an integral operator interface module, a primary power supply unit (capable of 120VAC or 240VAC), a 24VDC battery backup complete with battery charger capable of charging the batteries and shall have an 18ga painted NEMA 1 steel enclosure door. The control panel shall be specifically listed for the number and type of actuating devices utilized, and their compatibility shall have been listed. The auxiliary outputs shall be as per the manufacturer but shall provide the minimum as required for integration in any new or existing fire alarm system.

B. The control unit operator interface module shall provide a digital display, system control switches and light emitting diodes to indicate the status of individual input and output circuits and a summary of alarm, supervisory and trouble events. LEDs shall indicate Power ON, Alarm, Pre-Release, Releasing, Post-Release, Trouble, Supervisory and Signal Silenced. The digital display shall also provide a countdown timer to indicate the time remaining prior to impending suppression system release.

C. The control panel shall supervise the actuating devices and associated wiring and, as required, cause actuation.

D. Where pneumatic control equipment is used, the lines shall be protected against crimping and mechanical damage.

E. Alarms or indicators or both shall be used to indicate operation of the system, hazards to personnel, or failure of any supervised device. The type, number and location of the devices shall be such that their purpose shall be satisfactorily accomplished.

F. Audible and visual pre-discharge alarms shall be provided within the protected area and shall be located near the means of egress for the area. The abort switch shall be of a type that requires constant manual pressure to cause abort. In all cases, the normal manual control and the manual emergency control shall override the abort function. Operation of the abort function shall result in both audible and distinct visual indication of system impairment.

G. The basis of design for the releasing control panel is Honeywell Notifier RP-2002 with electric release, with appropriate outputs to the new annunciator panel (by others).

2.6 OPERATING DEVICES

A. Devices shall include agent-releasing devices or valves, discharge controls, and shutdown equipment necessary for successful performance of the system. Operation shall be by listed mechanical, electrical or pneumatic means. All devices shall be designed for the service they will encounter and shall not be rendered inoperative or susceptible to accidental operation.

B. A means of manual release of the system shall be provided. Manual release shall be accomplished by a mechanical or electrical manual release. The release shall cause simultaneous operation of automatically operated valves controlling agent release and distribution. Manual release shall not be required for automatic systems when the hazard being protected is unoccupiable and the hazard is in a remote location where personnel are not normally present.

C. A discharge pressure switch shall be required where mechanical system actuation is possible. This switch shall provide an alarm-initiating signal to the releasing panel.

D. All devices for shutting down supplementary equipment shall be considered integral parts of the system and shall function with the system operation.

2.7 NOZZLES

A. Quantity and location of nozzles shall be as designed per the manufacturer guidelines. Nozzle Types:
1. 180 degree semicircle discharge.
2. 360 degree full circle discharge.

B. Nozzles shall be UL and FM approved for clean agent extinguishing systems, sizes ½", 1", 1-1/2" and 2" NPT (orifice sizes per the manufacturer).

2.8 ALARM DEVICES

A. Alarm Devices: Detection devices shall be by any listed method or device capable of detecting and indicating heat, flame, smoke, combustible vapors, or an abnormal condition in the hazard, such as process trouble, that is likely to produce fire. The contractor shall include design of detection devices for the protected area and shall coordinate any area/room detection devices with the fire alarm design so as not to create a redundancy of devices.

B. Adequate and reliable primary and 24-hour minimum standby sources of energy shall be used to provide for operation of the detection, signaling, control, and actuation requirements of the system.

2.9 PRESSURE GAGES

A. Pressure Gages: UL 393, 3-1/2 to 4-1/2 inches diameter dial, with dial range of 0-250 psig.

2.10 AGENT STORAGE CONTAINERS

A. 3M Novec 1230 shall be stored in containers manufactured and marked in accordance with the US Department of Transportation (DOT) specification 4BW-500 or 4BA-500. The agent storage containers shall be conditioned to 360 psig @ 70degF (24.8 bar gauge @ 21 degC). Cylinder and valve assemblies shall be dual marked with Transport Canada (TC) specification 4BW-M34 or 4BA-M34. Containers shall be equipped with a pressure gauge to display internal pressures.

B. A low-pressure switch shall be provided as standard equipment such that a decrease in pressure will cause the normally open contacts to close, indicating a trouble condition at the control panel. The low-pressure switch shall be field removable/replaceable while the container is still fully charged.

PART 3 - EXECUTION

3.1 CLEAN AGENT INSTALLATION

A. The system shall be supplied and installed by a factory-authorized Contractor. The Contractor shall be trained and certified by system manufacturer to design, install and maintain the fire suppression system. The Contractor shall install the system in accordance with the manufacturer's design, installation, operation and maintenance manual, and per NFPA 2001.

B. A pre-discharge alarm and time delay, sufficient to allow personnel evacuation prior to discharge, shall be provided. Provide a supervised abort/disconnect switch, push and hold type, shall be provided and located in a lockable enclosure or require a non-removable key for switch activation. Achieve the minimum design extinguishing concentration as specified for the protected space(s). Within 10 seconds, the clean agent fire extinguishing system shall discharge 95% of the required suppression agent mass. 85% of the minimum design concentration shall be maintained in the protected space(s) for a minimum duration of 10-minutes.

C. The clean agent fire extinguishing system shall consist of two agent storage containers (one duty, one standby), distribution piping, discharge nozzles, detection devices, manual actuation and abort devices, visual and audible annunciators, control panel, and related equipment. The containers may be either connected to a discharge pipe arrangement separately or connected to a common manifold and discharge pipe arrangement. The agent storage container shall be filled with agent, and super pressurized with dry nitrogen to a working pressure according to the manufacturer's recommendations (i.e.: 360 PSIG at 70°F (24.8 bar gauge at 21°C) for NOVEC 1230).

D. All electrical enclosures, raceways, and conduits shall be provided and installed in accordance with applicable codes and intended use and shall contain only those electrical circuits associated with the fire-detection and control system. No circuit or circuits that are unrelated to the fire alarm or suppression system shall be routed through the enclosures, raceways, and conduits dedicated to the fire alarm or -suppression system.

E. Splicing of circuits shall not be allowed.

F. White colored wire shall be used exclusively for the identification of the neutral conductor of an alternating-current circuit. Green colored wire shall be used exclusively for the identification of the earth-ground conductor of an AC or DC circuit. Appropriate color-coding shall be utilized for all other field wiring.

G. All electrical circuits shall be numerically tagged with suitable markings at each terminal point. All circuits shall correspond with the installation drawings.

H. All conductors shall be enclosed in rigid conduit**,** meeting the materials and methods specified in Wood Fire Alarm Specification 143993-ASA-DF0-SPE-1712

with the electrical deliverables**.** Any conduit or raceway exposed to dampness or other similar conditions shall be properly sealed and installed to prevent moisture entrapment. Provisions for draining and drying shall be employed as required. All wiring shall be of the proper size to conduct the circuit current but shall not be smaller than #18 AWG unless permitted by the local electrical code. Wiring for the signaling line circuit shall be in accordance with the manufacturer's system Installation, Operation, and Maintenance Manual. Wire that has scrapes, nicks, gouges, or crushed insulation shall not be used. The manufacturer's minimum wire-bending radii shall be observed in all enclosures, raceways, and conduits. Aluminum wire shall not be used.

I. Conduct a door fan pressurization test during commissioning. All final-acceptance tests, including XL GAPS, shall be performed in the presence of the engineer and the authority having jurisdiction. The contractor shall record all equipment, tests and system configurations in a format approved by the manufacturer and/or the local Authority Having Jurisdiction. A copy of the commissioning tests and results shall be provided to the architect, the authority having jurisdiction, and the end-user.

3.2 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each suppression system.
   1. The completed system shall be reviewed and tested by personnel that have knowledge and experience of the requirements contained in this standard, of the installed equipment, and of the manufacturer's design, installation and maintenance manual.
   2. The system shall be tested in accordance with the system manufacturer and NFPA 2001, during system commissioning and periodically as per NFPA 2001 by personnel qualified to inspect, test, service and maintain clean agent fire extinguishing systems.
   3. The weight of the agent in the containers shall be verified by weighing or other approved methods.

B. Review of Components:
   1. The piping system shall be inspected to determine that it is in compliance with the design and installation documents.
   2. Nozzles and pipe size shall be in accordance with system drawings.
   3. Piping joints, discharge nozzles and piping supports shall be securely fastened to prevent unwanted vertical or lateral movement during discharge.
   4. Discharge nozzles shall be installed in such a manner that piping cannot become detached during discharge, and the nozzles shall be oriented in accordance with their listing.
   5. The pipe system shall be pressure tested in a closed circuit using nitrogen or other dry gas to atleast 40 psig. After removing the source of pressurizing gas, the pressure in the pipe shall not be less than 80 percent of the test pressure after 10 minutes.
   6. All total flooding systems shall have the room enclosure examined and tested to locate and then effectively seal any significant air leaks that

could result in a failure of the enclosure to hold the specified agent concentration level for the specified holding period. See NFPA 2001 for additional guidance on obtaining and recording quantitative results on room integrity.

7. All auxiliary functions such as alarm-sounding or displaying devices, remote annunciators, air-handling shutdown and power shutdown shall be checked for operation in accordance with the system design.
8. Detection devices shall be checked for type and location as specified on the system drawings and shall be installed in accordance with the manufacturer's technical data and the requirements of NFPA 72.

END OF SECTION

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix I – Process Equipment

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix J – Electrical Equipment Specifications, Datasheets, and One-Lines

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CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix K – Instrumentation Specifications with Photos

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FILED: November 30, 2021

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[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix L – Instrument Datasheets and Cutsheets

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[redacted]

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ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix M – Valve Datasheets with Photos

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In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix N – Civil Drawings

Filed pursuant to Ordering Paragraph No. 18
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FILED: November 30, 2021

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[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)))))))))	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix O – Structural Concrete Drawings

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[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix P – Structural Steel Drawings

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FILED: November 30, 2021

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In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix Q – Building Packages with Plans

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FILED: November 30, 2021

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[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix R – Fire Protection Drawings

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FILED: November 30, 2021

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In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix S – HVAC Drawings

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)))))))))	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix T – Piping Isometrics with Diagrams

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of Commission's August 6, 2020 Order
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INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix U – Piping Drawings

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

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In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix V – Electrical Drawings

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CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix W – Instrumentation Loops with Diagrams

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[redacted]

In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix X – Instrumentation Drawings

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In the Matter of:

ELECTRONIC APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR APPROVAL OF ITS 2020 ENVIRONMENTAL COMPLIANCE PLAN, AUTHORITY TO RECOVER COSTS THROUGH A REVISED ENVIRONMENTAL SURCHARGE AND TARIFF, THE ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR CERTAIN PROJECTS, AND APPROPRIATE ACCOUNTING AND OTHER RELIEF	)	**Case No. 2019-00435**

CONFIDENTIAL INFORMATION

Project 12
Wilson Station FGD Replacement and Upgrade

Appendix Y – Ductwork / Fluework with Diagrams

Filed pursuant to Ordering Paragraph No. 18
of Commission's August 6, 2020 Order
FILED: November 30, 2021

INFORMATION SUBMITTED with MOTION FOR CONFIDENTIAL TREATMENT

[redacted]

Big Rivers
ELECTRIC CORPORATION

Flue Gas Desulfurization Retrofit Project

D.B. Wilson Station, Centertown, Ky

Appendix Z – Rev 2

Reference Documentation

(No updates to any documents since Rev 0 Package)

Site Survey [1]

Geotechnical Engineering Study [1]

Application for Permit to Construct Across or Along a Stream and/or Water Quality Certification

Stormwater Pollution Prevention Plan [1]

Power System Study [1]

Existing Underground Drawings [1]

1. - Footnoted documents filed with a Motion for Confidential Treatment. Only Appendix A - Site Maps in the Stormwater Pollution Prevention Plan ("SWPPP") is filed with that Motion for Confidential Treatment, the remainder of the SWPPP is not confidential.

COMMONWEALTH OF KENTUCKY
ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WATER

APPLICATION FOR PERMIT TO CONSTRUCT ACROSS OR ALONG A STREAM AND / OR WATER QUALITY CERTIFICATION

Chapter 151 of the Kentucky Revised Statutes requires approval from the Division of Water prior to any construction or other activity in or along a stream that could in any way obstruct flood flows or adversely impact water quality. *If the project involves work in a stream, such as bank stabilization, dredging or relocation, a 401 Water Quality Certification (WQC) from the Division of Water will be required.* This completed form will be forwarded to the Water Quality Branch for WQC processing. The project may not start until all necessary approvals are received from the KDOW. For questions concerning the WQC process, contact the WQC section at 502/564-3410.

If the project will disturb more than 1 acre of soil, A Notice of Intent for Storm Water Discharges will also be required. Forms can be obtained at http://water.ky.gov/permitting/pages/generalpermits.aspx

1. **OWNER:** Big Rivers Electric Corporation
   Give name of person(s), company, governmental unit, or other owner of proposed project.
   MAILING ADDRESS: _____
   TELEPHONE #: _____ **EMAIL:** _____
2. **AGENT:** Mr. Doug Hall
   Give name of person(s) submitting application, if other than owner.
   ADDRESS: 1979 Lakeside Parkway #400, Tucker, GA 30084
   TELEPHONE #: [redacted] **EMAIL:** [redacted]
3. **ENGINEER:** Bradley Heilwagen **P.E. NUMBER:** 30960
   Contact Division of Water if waiver can be granted.
   TELEPHONE #: [redacted] **EMAIL:** [redacted]
4. **DESCRIPTION OF CONSTRUCTION:** Big Rivers Electric Corporation (BREC) intends to retrofit existing facilities at the D.B. Wilson Station near Centertown, Kentucky. An existing facility is being reconstructed to outfit the relocation of a WFGD absorber from Coleman Station to D.B. Wilson. Construction will involve filling the pad to an elevation above the 100-year flood elevation.
   List the items to be constructed in the floodplain
5. **COUNTY:** Ohio **NEAREST COMMUNITY:** Centertown
6. **USGS QUAD NAME** _____ **LATITUDE/LONGITUDE:** 37.449N, 87.081W
7. **STREAM NAME:** Green River **WATERSHED SIZE (in acres):** _____
8. **LINEAR FEET OF STREAM and/or ACRES OF WETLAND IMPACTED:** None. Construction in backwater.
9. **DIRECTIONS TO SITE:** From Owensboro, take US431 S for 19 miles. Turn left on KY-85E and take for 5 miles to site.

Stormwater Pollution Prevention Plan (SWPPP)

For Construction Activities At:

Big Rivers Electric Corporation
D.B. Wilson Station
5663 KY-85
Centertown, KY 42328
[redacted]

SWPPP Prepared For:

Big Rivers Electric Corporation
Ronald Gregory
5663 KY-85
Centertown, KY 42328
[redacted]

SWPPP Prepared By:

Wood.
(Doing Business as Wood Group USA, Inc.)
Brent Hanley, PE
30 Patewood Dr., Suite 200
Greenville, SC 291615
[redacted]

SWPPP Preparation Date:

05/21/2021

Estimated Project Dates:

Project Start Date: __ __ / __ __ / __ __ __ __
Project Completion Date: __ __ / __ __ / __ __ __ __

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SECTION 1: CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 Operator(s) / Subcontractor(s)

Operator(s):

Company: Big Rivers Electric Corporation
Name: Ronald Gregory
Address: 5663 KY-85
City, State, Zip Code: Centertown, KY 42328
Telephone Number: [redacted]
Fax/Email: [redacted]
Area of Control: Site wide

Subcontractor(s):

Company:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control:

Subcontractor(s):

Company:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control:

Subcontractor(s):

Company:
Name:
Address:
City, State, Zip Code:
Telephone Number:
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Fax/Email:
Area of Control:

Subcontractor(s):

Company:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control:

Subcontractor(s):

Company:
Name:
Address:
City, State, Zip Code:
Telephone Number:
Fax/Email:
Area of Control:

Emergency 24-Hour Contact:

Big Rivers Electric Company
Ronald Gregory
[redacted]

1.2 Stormwater Team

Stormwater Team		
Name and/or position, and contact	Responsibilities	I Have Read the Construction General Permit (CGP) and Understand the Applicable Requirements
Brent Hanley Civil Engineer [redacted]	SWPPP Preparer	☒ Yes Date: 21May2021
Ronald Gregory Project Manager [redacted]	24 Hour Contact and Inspector	☐ Yes Date:

SECTION 2: SITE EVALUATION, ASSESSMENT, AND PLANNING

2.1 Project/Site Information

Project Name and Address

Project/Site Name: D.B. Wilson Station
Project Street/Location: 5663 KY-85
City: Centertown
State: Kentucky
ZIP Code: 42328
County or Similar Subdivision: Ohio

Project Latitude/Longitude

(Use **one** of three possible formats, and specify method)

Latitude: 37 ° 26 ' 58" N
Longitude: 87 ° 4 ' 51" W

Latitude/longitude data source: Google Earth

Horizontal Reference Datum:
☐ NAD 27 ☐ NAD 83 or WGS 84 ☒ Plant Grid with reference to NAD 83

If you used a U.S.G.S topographic map, what was the scale? Site specific survey performed: FGD Project at Big Rivers Electric Surveying and Subsurface Utility Engineering" by Civil & Environmental Consultants, Inc dated December 2020.

Additional Project Information

Is the project/site located on Indian country lands, or located on a property of religious or cultural significance to an Indian tribe? ☐ Yes ☒ No

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2012 CGP? ☐ Yes ☒ No

2.2 Discharge Information

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☐ Yes ☒ No

Are there any surface waters that are located within 50 feet of your construction disturbances?
☐ Yes ☒ No

Table 1 – Names of Receiving Waters

Name(s) of the first surface water that receives stormwater directly from your site and/or from the MS4 (note: multiple rows provided where your site has more than one point of discharge that flows to different surface waters)
1. Elk Creek
2. Green River

Table 2 – Impaired Waters / TMDLs (Answer the following for each surface water listed in Table 1 above)

	Is this surface water listed as "impaired"?	If you answered yes, then answer the following:			
		What pollutant(s) are causing the impairment?	Has a TMDL been completed?	Title of the TMDL document	Pollutant(s) for which there is a TMDL
1. Elk Creek	☐ YES ☒ NO		☐ YES ☒ NO		
2. Green River	☐ YES ☒ NO		☐ YES ☒ NO		

Describe the method you used to determine whether or not your project/site discharges to an impaired water: Kentucky 303(d) list 2016 IR

Table 3 – Tier 2, 2.5, or 3 Waters (Answer the following for each surface water listed in Table 1 above)

	Is this surface water designated as a Tier 2, Tier 2.5, or Tier 3 water? (see Appendix F of the CGP)	If you answered yes, specify which Tier (2, 2.5, or 3) the surface water is designated as?
1. Elk Creek	☐ YES ☒ NO	N/A
2. Green River	☐ YES ☒ NO	N/A
3.	☐ YES ☐ NO	
4.	☐ YES ☐ NO	
5.	☐ YES ☐ NO	
6.	☐ YES ☐ NO	

2.3 Nature of the Construction Activity

General Description of Project

Provide a general description of the construction project:

- The Absorber Project consists of a relocated absorber and proposed inlet/outlet ducts, blower building, electrical building, transformers, sump, and miscellaneous tanks.

Size of Construction Site

Size of Property (acres)	1,763
Total Area Expected to be Disturbed by Construction Activities (acres)	+/- 10.0
Maximum Area Expected to be Disturbed at Any One Time (acres)	2.0

Construction Support Activities (only provide if applicable)
Describe any construction support activities for the project (e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas)
Equipment staging areas, material storage areas, stockpile areas will be located adjacent to the project site along the west edge.

Ronald Gregory
Project Manager
[redacted]

2.4 Sequence and Estimated Dates of Construction Activities

Clearing and Grubbing and Demolition	
Estimated Start Date of Construction Activities for this Phase	8/10/2021
Estimated End Date of Construction Activities for this Phase	8/21/2021
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	8/10/2021
Estimated Date(s) when Stormwater Controls will be Removed	2/1/2022

Grading and Site Preparation	
Estimated Start Date of Construction Activities for this Phase	8/24/2021
Estimated End Date of Construction Activities for this Phase	9/25/2021
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	8/10/2021
Estimated Date(s) when Stormwater Controls will be Removed	2/1/2022

Fine Grading and Asphalt Paving	
Estimated Start Date of Construction Activities for this Phase	9/28/2021

Estimated End Date of Construction Activities for this Phase	10/19/2021
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	8/10/2021
Estimated Date(s) when Stormwater Controls will be Removed	2/1/2022

Building Construction	
Estimated Start Date of Construction Activities for this Phase	9/28/2021
Estimated End Date of Construction Activities for this Phase	2/1/2022
Estimated Date(s) of Application of Stabilization Measures for Areas of the Site Required to be Stabilized	8/10/2021
Estimated Date(s) when Stormwater Controls will be Removed	2/1/2022

2.5 Allowable Non-Stormwater Discharges

List of Allowable Non-Stormwater Discharges Present at the Site

Type of Authorized Non-Stormwater Discharge	Likely to be Present at Your Site?
Discharges from emergency fire-fighting activities	☒ Yes ☐ No
Fire hydrant flushings	☒ Yes ☐ No
Landscape irrigation	☐ Yes ☒ No
Waters used to wash vehicles and equipment	☐ Yes ☒ No
Water used to control dust	☒ Yes ☐ No
Potable water including uncontaminated water line flushings	☒ Yes ☐ No
External building washdown (soaps/solvents are not used and external surfaces do not contain hazardous substances)	☐ Yes ☒ No
Pavement wash waters	☐ Yes ☒ No
Uncontaminated air conditioning or compressor condensate	☒ Yes ☐ No
Uncontaminated, non-turbid discharges of ground water or spring water	☐ Yes ☒ No
Foundation or footing drains	☐ Yes ☒ No
Construction dewatering water	☒ Yes ☐ No

2.6 Site Maps

See SWPPP Appendix A.

SECTION 3: DOCUMENTATION OF COMPLIANCE WITH OTHER FEDERAL REQUIREMENTS

3.1 Endangered Species Protection

Eligibility Criterion

Under which criterion listed in Appendix D of the CGP are you eligible for coverage under this permit?

☒ **A** ☐ **B** ☐ **C** ☐ **D** ☐ **E**

For reference purposes, the eligibility criteria listed in Appendix D are as follows:

Criterion A. No federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's "action area" as defined in Appendix A of this permit.

Criterion B. The construction site's discharges and discharge-related activities were already addressed in another operator's valid certification of eligibility for your action area under eligibility Criterion A, C, D, E, or F and there is no reason to believe that federally-listed species or federally-designated critical habitat not considered in the prior certification may be present or located in the "action area". To certify your eligibility under this Criterion, there must be no lapse of NPDES permit coverage in the other operator's certification. By certifying eligibility under this Criterion, you agree to comply with any effluent limitations or conditions upon which the other operator's certification was based. You must include in your NOI the tracking number from the other operator's notification of authorization under this permit. If your certification is based on another operator's certification under Criterion C, you must provide EPA with the relevant supporting information required of existing dischargers in Criterion C in your NOI form.

Criterion C. Federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in or near your site's "action area," and your site's discharges and discharge-related activities are not likely to adversely affect listed threatened or endangered species or critical habitat. This determination may include consideration of any stormwater controls and/or management practices you will adopt to ensure that your discharges and discharge-related activities are not likely to adversely affect listed species and critical habitat. To make this certification, you must include the following in your NOI: 1) any federally listed species and/or designated habitat located in your "action area"; and 2) the distance between your site and the listed species or designated critical habitat (in miles). You must also include a copy of your site map with your NOI.

Criterion D. Coordination between you and the Services has been concluded. The coordination must have addressed the effects of your site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat, and must have resulted in a written concurrence from the relevant Service(s) that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Criterion E. Consultation between a Federal Agency and the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service under section 7 of the ESA has been concluded. The consultation must have addressed the effects of the construction site's discharges and discharge-related activities on federally-listed threatened or endangered species and federally-designated critical habitat. The result of this consultation must be either:

i. a biological opinion that concludes that the action in question (taking into account the effects of your site's discharges and discharge-related activities) is not likely to jeopardize the continued existence of listed species, nor the destruction or adverse modification of critical habitat; or

ii. written concurrence from the applicable Service(s) with a finding that the site's discharges and discharge-related activities are not likely to adversely affect federally-listed species or federally-designated habitat.

You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Criterion F. Your construction activities are authorized through the issuance of a permit under section 10 of the ESA, and this authorization addresses the effects of the site's discharges and discharge-related activities on federally-listed species and federally-designated critical habitat. You must include copies of the correspondence between yourself and the Services in your SWPPP and your NOI.

Supporting Documentation

Provide documentation for the applicable eligibility criterion you select in Appendix D of the CGP, as follows:

For criterion A, indicate the basis for your determination that no federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur in your site's action area (as defined in Appendix A of the CGP). Check the applicable source of information you relied upon:

☐ Specific communication with staff of the U.S. Fish & Wildlife Service or National Marine Fisheries Service.
☐ Publicly available species list.
☒ Other source:
USFWS Threatened & Endangered Species Active Critical Habitat Report
https://fws.maps.arcgis.com/home/webmap/viewer.html?webmap=9d8de5e265ad4fe09893cf75b8dbfb77

For criterion B, provide the Tracking Number from the other operator's notification of permit authorization:
Provide a brief summary of the basis used by the other operator for selecting criterion A, B, C, D, E, or F:

For criterion C, provide the following information:
Also, provide a brief summary of the basis used for determining that your site's discharges and discharge-related activities are not likely to adversely affect listed species or critical habitat:

For criterion D, E, or F, attach copies of any letters or other communication between you and the U.S. Fish & Wildlife Service or National Marine Fisheries Service concluding consultation or coordination activities.

3.2 Historic Preservation

Appendix E, Step 1

Do you plan on installing any of the following stormwater controls at your site? Check all that apply below, and proceed to Appendix E, Step 2.

- ☐ Dike
- ☐ Berm
- ☒ Catch Basin
- ☐ Pond
- ☒ Stormwater Conveyance Channel (e.g., ditch, trench, perimeter drain, swale, etc.)
- ☒ Culvert
- ☐ Other type of ground-disturbing stormwater control:

Appendix E, Step 2

If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties? ☒ YES ☐ NO

- If yes, no further documentation is required for Section 3.2 of the Template.
- If no, proceed to Appendix E, Step 3.

Appendix E, Step 3

If you answered no in Step 2, have you determined that your installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties? ☐ YES ☐ NO

If yes, provide documentation of the basis for your determination.

If no, proceed to Appendix E, Step 4.

Appendix E, Step 4

If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond to you within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties? ☐ YES ☐ NO

If no, no further documentation is required for Section 3.2 of the Template.

If yes, describe the nature of their response:

- ☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.
- ☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 Safe Drinking Water Act Underground Injection Control Requirements

Do you plan to install any of the following controls? Check all that apply below.

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☐ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes,

N/A

SECTION 4: EROSION AND SEDIMENT CONTROLS

4.1 Natural Buffers or Equivalent Sediment Controls

Buffer Compliance Alternatives

Are there any surface waters within 50 feet of your project's earth disturbances? ☐ YES ☒ NO

Check the compliance alternative that you have chosen:

☐ I will provide and maintain a 50-foot undisturbed natural buffer.

☐ I will provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by additional erosion and sediment controls, which in combination achieves the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☐ It is infeasible to provide and maintain an undisturbed natural buffer of any size, therefore I will implement erosion and sediment controls that achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

☐ I qualify for one of the exceptions in Part 2.1.2.1.e. (If you have checked this box, provide information on the applicable buffer exception that applies, below.)

Buffer Exceptions

Which of the following exceptions to the buffer requirements applies to your site?

☐ There is no discharge of stormwater to the surface water that is located 50 feet from my construction disturbances.

☐ No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.

☐ For a "linear project" (defined in Appendix A), site constraints (e.g., limited right-of-way) make it infeasible for me to meet any of the CGP Part 2.1.2.1.a compliance alternatives.

☐ The project qualifies as "small residential lot" construction (defined in Part 2.1.2.1.e.iv and in Appendix A).

For Alternative 1 (see Appendix G, Part G.2.3.2.a):

For Alternative 2 (see Appendix G, Part G.2.3.2.b):

☐ Buffer disturbances are authorized under a CWA Section 404 permit.

☐ Buffer disturbances will occur for the construction of a water-dependent structure or water access area (e.g., pier, boat ramp, and trail).

4.2 Perimeter Controls

General

- Perimeter control structures shall be functional throughout the course of earth disturbing activity. Perimeter controls shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the upslope development area is stabilized with permanent cover. As construction progresses, perimeter controls shall be maintained throughout the duration by removing sediment before it has accumulated to one-half of the above ground height.

Specific Perimeter Controls

SILT FENCE	
Description: Silt fence is a sediment-trapping practice utilizing a geotextile fence, topography and sometimes vegetation to cause sediment deposition. Silt fence reduces runoff's ability to transport sediment by ponding runoff and dissipating small rills of concentrated flow into uniform sheet flow.	
Installation	DATE OF INSTALLATION: Silt Fence shall be installed before any land disturbance activities.
Maintenance Requirements	Silt Fence requires regular inspection and maintenance to ensure its effectiveness. Silt fences must be inspected after each rainfall and at least daily during prolonged rainfall. Silt fence found damaged or improperly installed shall be replaced or repaired immediately. Sediment deposits shall be routinely removed when they reach approximately one-half the height of the silt fence.
Design Specifications	See Construction Drawings and Details

4.3 Sediment Track-Out

General

- Sediment track-out control structures shall be functional throughout the course of earth disturbing activity. Sediment track-out controls shall be implemented prior to grading and within seven days from the start of grubbing. They shall continue to function until the development area is stabilized with permanent cover. Where sediment has been tracked-out from the site onto paved roads, sidewalks, or other paved areas outside of the site, the deposited sediment shall be removed by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. The track-out shall be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. It shall be prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S.

Specific Track-Out Controls

STABILIZED CONSTRUCTION ENTRANCE	
Description: A stabilized construction entrance is a stabilized pad of stone underlain with a geotextile and is used to reduce the amount of mud tracked off-site with construction traffic. Located at points of ingress/egress, the practice is used to reduce the amount of mud tracked off-site with construction traffic.	
Installation	DATE OF INSTALLATION:

	Stabilized Construction Entrance shall be installed before any major earthmoving activities begin.
Maintenance Requirements	The entrance shall be maintained in a condition that will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand and repair and/or cleanout of any structures used to trap sediment. Where sediment has been tracked-out from your site onto paved roads, sidewalks, or other paved areas outside of your site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. It is prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S.
Design Specifications	See Construction Drawings and Details

4.4 Stockpiled Sediment or Soil

General

- Stockpile perimeter controls shall be implemented around all stockpiled sediment and soil. Stockpiles shall be located outside of any natural buffers and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated. For piles that will be unused for 14 or more days, stockpiles shall be temporarily seeded. It is prohibited from hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the U.S.")

Specific Stockpile Controls

TEMPORARY SEEDING	
Description: Temporary seedings establish temporary cover on disturbed areas by planting appropriate rapidly growing annual grasses or small grains. Temporary seeding provides erosion control on areas in between construction operations. Grasses, which are quick growing, are seeded and usually mulched to provide prompt, temporary soil stabilization. It effectively minimizes the area of a construction site prone to erosion and should be used everywhere the sequence of construction operations allows vegetation to be established.	
Installation	DATE OF INSTALLATION: Temporary Seeding shall be installed if pile will be unused for 14 or more days.
Maintenance Requirements	Areas failing to establish vegetative cover adequate to prevent erosion shall be reseeded as soon as such areas are identified. Seeding performed during hot and dry summer months shall be watered at a rate of 1 inch per week.
Design Specifications	See Construction Drawings and Details

SILT FENCE
Description: Silt fence is a sediment-trapping practice utilizing a geotextile fence, topography and sometimes vegetation to cause sediment deposition. Silt fence reduces runoff's ability to

transport sediment by ponding runoff and dissipating small rills of concentrated flow into uniform sheet flow.	
Installation	DATE OF INSTALLATION: Silt Fence shall be installed around the entire perimeter of each stockpile immediately after it is placed.
Maintenance Requirements	Silt Fence requires regular inspection and maintenance to ensure its effectiveness. Silt fences must be inspected after each rainfall and at least daily during prolonged rainfall. Silt fence found damaged or improperly installed shall be replaced or repaired immediately. Sediment deposits shall be routinely removed when they reach approximately one-half the height of the silt fence.
Design Specifications	See Construction Drawings and Details

4.5 Minimize Dust

General

- On areas of exposed soil, dust shall be minimized through appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged in stormwater from the site.

Specific Dust Controls

DUST CONTROLS	
Description: Dust control involves preventing or reducing dust from exposed soils or other sources during land disturbing, demolition and construction activities to reduce the presence of air-borne substances which may present health hazards, traffic safety problems or harm animal or plant life.	
Installation	DATE OF INSTALLATION: As needed to minimize dust
Maintenance Requirements	Most dust control measures, such as applications of water will require monitoring and repeat applications as needed to accomplish good control.
Design Specifications	See Construction Drawings and Details

4.6 Minimize the Disturbance of Steep Slopes

General

- Steep Slope Controls consists of surface roughening and rolled erosion control product. Using these controls will minimize the disturbance of steep slopes.

Specific Steep Slope Controls

SURFACE ROUGHTENING
Description: Grade Treatment or surface roughening creates horizontal depressions in the soil surface that help to reduce erosion by reducing runoff velocity and increasing infiltration. These depressions aid in the establishment of vegetative cover and provide localized trapping of sediments. Grade Treatment is typically created by operating tillage implements on the contour or by running tracked equipment up and down a slope without fine grading the surface.

Installation	DATE OF INSTALLATION: As needed to minimize Steep Slope Disturbances
Maintenance Requirements	Roughened areas shall be seeded and mulched within seven (7) days of last disturbance to obtain optimum seed germination and seedling growth.
Design Specifications	See Construction Drawings and Details

ROLLED EROSION CONTROL PRODUCT	
Description: A Temporary Rolled Erosion Control Product (TRECP) is a degradable manufactured material used to stabilize easily eroded areas while vegetation becomes established. Temporary Rolled Erosion Control Products are degradable products composed of biologically, photo chemically or otherwise degradable materials. Temporary RECPs consist of erosion control netting, open weave textiles, and erosion control blankets and mattings. These products reduce soil erosion and assist vegetative growth by providing temporary cover from the erosive action of rainfall and runoff while providing soil-seed contact.	
Installation	DATE OF INSTALLATION: As needed to minimize Steep Slope Disturbances
Maintenance Requirements	Roughened areas shall be seeded and mulched within seven (7) days of last disturbance to obtain optimum seed germination and seedling growth.
Design Specifications	See Construction Drawings and Details

4.7 Topsoil

General

- Topsoiling is when the upper most organic layer of soil is stripped and stockpiled from areas being graded and subsequently replaced on the newly graded areas. The native topsoil shall be preserved, if feasible.

Specific Topsoil Controls

TOPSOILING	
Description: Topsoiling occurs during grading operations as the upper most organic layer of soil is stripped and stockpiled from areas being graded and subsequently replaced on the newly graded areas. Topsoil provides a more suitable growing medium than subsoil or on areas with poor moisture, low nutrient levels, undesirable pH, or in the presence of other materials that would inhibit establishment of vegetation. Replacing topsoil helps plant growth by improving the water holding capacity and nutrient content and consistency of the soils.	
Installation	DATE OF INSTALLATION: As stripping of the topsoil occurs.
Maintenance Requirements	Topsoil stockpiles shall be protected to minimize any erosion. Temporary cover BMPs include temporary seeding, mulches, blankets, or mats.
Design Specifications	See Construction Drawings and Details

4.8 Soil Compaction

General

- Soil Compaction shall be implemented in areas where final vegetative stabilization will occur or where infiltration practices will be installed.

Specific Soil Compaction Controls

PERMANENT SEEDING	
Description: Permanent vegetation is used to stabilize soil, reduce erosion, prevent sediment pollution, reduce runoff by promoting infiltration, and provide stormwater quality benefits offered by dense grass cover. Storm water quality and the amount of runoff both vary significantly with soil compaction. Non-compacted soils improve stormwater infiltration by promoting: • dense vegetative growth; • high soil infiltration & lower runoff rates; • pollutant filtration, deposition & absorption; and • beneficial biologic activity in the soil. Construction activity creates highly compacted soils that restrict water infiltration and root growth. The best time for improving soil condition is during the establishment of permanent vegetation. It is highly recommended that subsoilers, plows, or other implements are specified as part of final seedbed preparation. Use discretion in slip-prone areas.	
Installation	DATE OF INSTALLATION: Applied within 14 days of completion of work in areas set to final grade and topsoiling has been completed.
Maintenance Requirements	Permanent seeding shall not be considered established for at least 1 full year from the time of planting. Inspect the seeding for soil erosion or plant loss during this first year. Repair bare and sparse areas. Fill gullies. Re-fertilize, re-seed, and re-mulch if required. Consider no-till planting. A minimum of 70% growth density, based on a visual inspection, must exist for an adequate permanent vegetative planting.
Design Specifications	See Construction Drawings and Details

4.9 Storm Drain Inlets

General

- Inlet protection measures shall be installed to remove sediment from discharges prior to entry into any storm drain inlet. Inlet protection measures shall be cleaned, or removed and replaced as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.

Specific Storm Drain Inlet Controls

STORM DRAIN INLET PROTECTION	
Description: Storm drain inlet protection devices remove sediment from storm water before it enters storm sewers and downstream areas. Inlet protection devices are sediment barriers that may be constructed of washed gravel or crushed stone, geotextile fabrics and other materials that are supported around or across storm drain inlets. Inlet protection is installed to capture some sediment and reduce the maintenance of storm sewers and other underground piping systems prior to the site being stabilized. Due to their poorer effectiveness, inlet protection is considered a secondary sediment control to be used in conjunction with other more effective controls.	
Installation	DATE OF INSTALLATION: Before grading activities begin for existing inlets and after inlets have been installed for proposed inlets

Maintenance Requirements	Effective storm drain inlet protection collects sediment and therefore must be cleaned regularly to prevent clogging and subsequent flooding conditions, piping, or overtopping of the control structures. Sediment barriers that sag, fall over, or are not properly secured, must be promptly repaired or replaced. Inlet protection shall be inspected weekly and after each rainfall event. Areas where there is active traffic shall be inspected daily. Repairs shall be made as needed to assure the practice is performing as intended. Sediment shall be removed when accumulation is one-half the height of the trap. Sediment shall not be washed into the inlet. Sediment shall be removed and placed in a location where it is stable and not subject to erosion. Once the contributing drainage area has been properly stabilized, all filter material and collected sediment shall be removed and properly disposed. Clean, or remove and replace the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.
Design Specifications	See Construction Drawings and Details

BLOCK AND GRAVEL	
Description: Block and gravel inlet protection devices use block and gravel filters installed over the storm water inlet to remove sediment from storm water before it enters storm sewers and downstream areas.	
Installation	DATE OF INSTALLATION: Before grading activities begin for existing inlets and after inlets have been installed for proposed inlets
Maintenance Requirements	Effective storm drain inlet protection collects sediment and therefore must be cleaned regularly to prevent clogging and subsequent flooding conditions, piping, or overtopping of the control structures. Sediment barriers that sag, fall over, or are not properly secured, must be promptly repaired or replaced. Inlet protection shall be inspected weekly and after each rainfall event. Areas where there is active traffic shall be inspected daily. Repairs shall be made as needed to assure the practice is performing as intended. Sediment shall be removed when accumulation is one-half the height of the trap. Sediment shall not be washed into the inlet. Sediment shall be removed and placed in a location where it is stable and not subject to erosion. Once the contributing drainage area has been properly stabilized, all filter material and collected sediment shall be removed and properly disposed. Clean, or remove and replace the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.
Design Specifications	See Construction Drawings and Details

4.10 Constructed Stormwater Conveyance Channels

General

- Stormwater conveyance channels controls shall be installed to control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points.

Specific Conveyance Channel Controls

ROCK CHECK DAMS	
Description: Check dams are shaped rock dams constructed in swales, grassed waterways or diversions. They reduce the velocity of concentrated flows, thereby reducing erosion within the swale or waterway.	
Installation	DATE OF INSTALLATION: Check dams shall be installed before any land disturbance activities in existing conveyance, and immediately following installation of proposed conveyances.
Maintenance Requirements	Sediment shall be removed from behind check dam once it accumulates to one-half the original height of the check dam.
Design Specifications	See Construction Drawings and Details

ROCK OUTLET PROTECTION	
Description: A rock or riprap apron typically needed at the outlet of storm drains, culverts, or open channels. Rock Outlet Protection provides an erosion resistant transition area where concentrated or high velocity flows enter less modified channels or natural streams.	
Installation	DATE OF INSTALLATION: After storm drainage conveyances have been installed.
Maintenance Requirements	A maintenance program shall be established to maintain riprap and associated structural components such as pipe outlets, and tile lines. Items to consider in the maintenance program include: • Determine responsible party to inspect and maintain the outlet protection after construction. • Missing riprap should be replaced as soon as possible. • Protect the outlet protection from damage by equipment and traffic. • Remove sediment and debris that have accumulated.
Design Specifications	See Construction Drawings and Details

TEMPORARY DIVERSION	
Description: A temporary diversion is used to redirect sheet flow runoff from denuded areas. Runoff shall be intercepted by diversions to protect adjacent properties and water resources from sediment transported	
Installation	DATE OF INSTALLATION: Install at the beginning of earth disturbing operations to protect adjacent areas from damaging sheet and shallow concentrated flow.
Maintenance Requirements	A maintenance program shall be established to remove sediment and debris that have accumulated.
Design Specifications	See Construction Drawings and Details

4.11 Sediment Basins

General

- Sediment basins shall be installed outside of any waters of the US and any natural buffers. Basins shall be installed to avoid collecting water from wetlands. They shall be designed to provide storage for the 2-year, 24-hour design storm or 3,600 cubic feet per drained acre. Basins shall utilize outlet structures that withdraw water from the surface of the sediment basin. Basins shall use erosion control and velocity dissipation devices to prevent erosion at inlets and outlets.

Specific Sediment Basin Controls

SEDIMENT TRAP	
Description: A sediment trap is a temporary settling pond formed by construction of an embankment and/or excavated basin and having a simple outlet structure that is typically stabilized with geotextile and rip-rap. Sediment traps are constructed to detain sediment-laden runoff from small, disturbed areas for a sufficient period of time to allow the majority of the sediment to settle out. They are established early in the construction process using natural drainage patterns and favorable topography where possible to minimize grading.	
Installation	DATE OF INSTALLATION: Before disturbing more than 5 acres
Maintenance Requirements	The capacity and function of the sediment trap shall be maintained by inspecting on a weekly basis and after each runoff event, and by performing the necessary activities below. • Establish vegetative cover and fertilize as necessary to maintain a vigorous cover around the sediment trap. • Inspect the pool area, embankment and spillway area for burrowing rodents, slope failure, seepage, excess settlement, and displaced stone. The area should be inspected for structural soundness and repaired as needed. • Regularly inspect water discharged from trap for excess suspended sediments. Identify and perform necessary repairs to improve water quality. Excessive suspended sediments may require design modifications or treatment with flocculants. • Remove woody vegetated growth on the embankment and spillway areas. • Remove trash and debris that accumulate in the pond and have potential to block spill-ways. • Dewatering outlets shall be regularly checked to ensure that performance is maintained. Filter stone choked with sediment shall be removed and replaced to restore its flow capacity. • Remove sediment and restore the sediment trap to its original dimensions when sediment has accumulated to the top of the sediment storage or wet storage zone. This elevation shall be signified by the top of a stake near the center of the trap. Removing sediment by hand may be necessary adjacent to the outlet section of the embankment to prevent equipment damage. Place the removed sediment and stabilize with vegetation in a designated area where it will not easily erode again. Restore trap to its original dimensions and replace stone as needed on the outlet.

	After the entire construction project is completed, temporary sediment traps should be dewatered and regraded so as to conform to the contours of the area. All temporary structures shall be removed and the area seeded, mulched and stabilized as necessary.
Design Specifications	See Construction Drawings and Details

4.12 Chemical Treatment

Soil Types
List all the soil types (including soil types expected to be found in fill material) that are expected to be exposed during construction in areas of the project that will drain to chemical treatment systems: The general soil profile can be divided into four strata:

- Fill material;
- Clay Residuum;
- Decomposed Shale;
- Limestone bedrock.

Treatment Chemicals
List all treatment chemicals that will be used at the site and explain why these chemicals are suited to the soil characteristics: No Fertilization or pesticide applications are planned for this project. All concrete and asphalt will be delivered to the site in trucks and immediately placed. A concrete washout area will be used for cleaning of the concrete trucks. No onsite batch plants will be used. The equipment/vehicle fueling and maintenance practice that will be implemented to eliminate the discharge of spilled or leaked fuel will be a Fuel Containment Area. Contractor will have a designated area for fuel storage and handling that is equipped with spill response tools for containment and fast clean up. All vehicle maintenance to be performed off site in an approved location. Refer to Construction Drawings (Site Maps and Details) for information and details corresponding to the selected BMPs.

Describe the dosage of all treatment chemicals you will use at the site or the methodology you will use to determine dosage: N/A

Provide information from any applicable Safety Data Sheets (SDS): N/A

Describe how each of the chemicals will stored: N/A

Include references to applicable state or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems: N/A

Special Controls for Cationic Treatment Chemicals (if applicable)
If the applicable EPA Regional Office authorized you to use cationic treatment chemicals, include the official EPA authorization letter or other communication, and identify the specific controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to an exceedance of water quality standards: N/A

Schematic Drawings of Stormwater Controls/Chemical Treatment Systems
Provide schematic drawings of any chemically-enhanced stormwater controls or chemical treatment systems to be used for application of treatment chemicals: N/A

Training
Describe the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to the use of treatment chemicals: N/A

4.13 Dewatering Practices

General

- Contractor shall treat dewatering discharges with controls to minimize discharges of pollutants. Contractor shall not discharge dewatering discharges if visible solids or foam are present. Dewatering activities shall utilize a suitable filtration device that is designed to remove suspended solids. Contractor shall replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.

Specific Dewatering Practices

DEWATERING MEASURES	
Description: Dewatering measures provide a stable area for receiving and treating water pumped from excavation or work areas prior to being released off the site. These practices reduce sediment impacts to downstream water resources. Geotextile Filter Bags: Commonly discharge is pumped into a filter bag chosen for the predominant sediment size. Filter bags are manufactured products made typically from woven monofilament polypropylene textile (coarse materials, e.g. sands) or non-woven geotextile (silts/clays). While they may be useful, they are generally high flow products, which have limited ability to treat fine-grained sediments. Gravity drained filter bags should apply the following: • They should be placed outside of a vegetated filter area and not in close proximity to site storm water controls. • They must sit on a relatively flat grade so that water leaving the bag does not cause additional erosion. Placing the bag on a flat bed of aggregate will maximize the flow and useful surface area of the bag.	
Installation	DATE OF INSTALLATION: Before dewatering activities occur.
Maintenance Requirements	Filter Bags are single use products that must be replaced when they become clogged or half full of sediment. Trapped sediment to be removed shall be spread on the project site at an appropriate location away from storm water controls and stabilized with permanent seeding. With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
Design Specifications	See Construction Drawings and Details

4.14 Other Stormwater Controls

General

- N/A

Specific Stormwater Control Practices

- N/A

4.15 Site Stabilization

Total Amount of Land Disturbance Occurring at Any One Time

☐ *Five Acres or less*

☒ *More than Five Acres*

TEMPORARY SEEDING	
☒ *Vegetative* ☐ *Non-Vegetative* ☒ *Temporary* ☐ *Permanent*	
Description: ▪ Temporary seedings establish temporary cover on disturbed areas by planting appropriate rapidly growing annual grasses or small grains. Temporary seeding provides erosion control on areas in between construction operations. Grasses, which are quick growing, are seeded and usually mulched to provide prompt, temporary soil stabilization. ▪ Temporary seeding should be applied on exposed soil where additional work is not scheduled for more than 14 days.	
Installation	DATE OF INSTALLATION:
Completion	COMPLETION DATE:
Maintenance Requirements	Areas failing to establish vegetative cover adequate to prevent erosion shall be reseeded as soon as such areas are identified.
Design Specifications	See Construction Drawings and Details

TEMPORARY AGGREGATE SURFACING	
☐ *Vegetative* ☒ *Non-Vegetative* ☒ *Temporary* ☐ *Permanent*	
Description: ▪ Temporary aggregate is a temporary cover on disturbed areas by placing and compacting aggregate. Temporary aggregate surfacing provides a laydown area for construction operations. ▪ Temporary Aggregate Surfacing should be applied on exposed soil where additional work is not scheduled for more than 14 days.	
Installation	DATE OF INSTALLATION:
Completion	COMPLETION DATE:
Maintenance Requirements	This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand.
Design Specifications	See Construction Drawings and Details

PERMANENT SEEDING
☒ *Vegetative* ☐ *Non-Vegetative* ☐ *Temporary* ☒ *Permanent*
Description: ▪ Permanent vegetation is used to stabilize soil, reduce erosion, prevent sediment pollution, reduce runoff by promoting infiltration, and provide stormwater quality benefits offered by dense grass cover. ▪ Any disturbed areas or portions of construction sites at final grade. Permanent seeding should not be delayed on any one portion of the site at final grade while construction on another portion of the site is being completed. Permanent seeding shall be completed in phases, if necessary.

Installation	DATE OF INSTALLATION:
Completion	COMPLETION DATE:
Maintenance Requirements	Permanent seeding shall not be considered established for at least 1 full year from the time of planting. Inspect the seeding for soil erosion or plant loss during this first year. Repair bare and sparse areas. Fill gullies. Re-seed and re-mulch if required. Consider no-till planting. A minimum of 70% growth density, based on a visual inspection, must exist for an adequate permanent vegetative planting.
Design Specifications	See Construction Drawings and Details

PERMANENT AGGREGATE SURFACING	
☐ *Vegetative* ☒ *Non-Vegetative* ☐ *Temporary* ☒ *Permanent*	
Description: ▪ Permanent aggregate is a permanent cover on disturbed areas by placing and compacting aggregate.	
Installation	DATE OF INSTALLATION:
Completion	COMPLETION DATE:
Maintenance Requirements	This may require periodic top dressing with additional stone or the washing and reworking of existing stone as conditions demand.
Design Specifications	See Construction Drawings and Details

SECTION 5: POLLUTION PREVENTION STANDARDS

5.1 Potential Sources of Pollution

Construction Site Pollutants

See Table Below

Pollutant-Generating Activity	**Pollutants or Pollutant Constituents** (that could be discharged if exposed to stormwater)	**Location on Site** (or reference SWPPP site map where this is shown)
Fueling	Diesel, Gasoline	See Construction Drawing
Paving Operations	Volatile Organic Compounds	Throughout Project (See Construction Drawing)
Concrete Washout	Slurry containing toxic metals that is caustic and corrosive.	See Construction Drawing
Paint	Water or Solvent based paints	Site Wide
Solid Waste Dumpsters	General Waste	At appropriate site locations
Equipment Outdoor Storage (laydown areas)	General Waste	See Construction Drawing
Generators	Diesel, Gasoline	At appropriate site locations
Loading / unloading operations	General Waste	Site Wide
Construction Equipment	Diesel, Oil	Site Wide

5.2 Spill Prevention and Response

Any hazardous or potentially hazardous material that is brought onto the construction site shall be handled properly to reduce the potential for stormwater pollution. All materials used on this construction site shall be properly stored, handled, dispensed and disposed of following all applicable label directions. Flammable and combustible liquids shall be stored and handled according to applicable regulations. Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids.

Safety Data Sheets (SDS) information shall be kept on site for all hazardous or potentially hazardous materials. Alternately, SDS may also be accessed via telephone or other electronic means or apparatus.

In the event of an accidental spill, immediate action shall be taken by the Contractor to contain and remove the spilled material. The spill shall be reported to the appropriate agencies in the required time frames. As required under the provisions of the Clean Water Act, any spill or discharge entering waters of the United States shall be properly reported.

Any spills of petroleum products or hazardous materials in excess of reportable quantities as defined by the EPA, state or local agency regulations, shall be immediately reported and documented.

To minimize the potential for spills to come into contact with stormwater, the following steps shall be taken:

1. All materials with hazardous properties, including but not necessarily limited to, pesticides, petroleum products, fertilizers, soaps, detergents, construction chemicals, acids, bases, paints, paint solvents, additives for soil stabilization, concrete, curing compounds and additives, shall be stored in a secure location, under cover and in appropriate, tightly sealed containers when not in use.
2. The minimum practical quantity of all such materials shall be kept on the job site and scheduled for delivery as close to time of use as practical.
3. A spill control and containment kit (containing for example, absorbent material such as kitty litter or sawdust, acid, base, neutralizing agent, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be provided at the construction site and its location(s) shall be identified with legible signage and annotated by the Contractor on the Construction Drawings.
    a. The spill control and containment kit supplies shall be of sufficient quantities and appropriate content to contain a spill from the largest anticipated piece of equipment and from the largest anticipated quantities of products stored on the site at any given time.
    b. Contents shall be inspected regularly.
4. All products shall be stored in and used from the original container with the original product label. Containers must be stored in a manner to protect them from the elements and incidental damage.
5. All products shall be used in strict compliance with instructions on the product label.

The disposal of excess or used products shall be in strict compliance with instructions on the product label and regulations.

5.3 Fueling and Maintenance of Equipment or Vehicles

General

- The equipment/vehicle fueling and maintenance practice that will be implemented to eliminate the discharge of spilled or leaked chemicals will be a Fuel Containment Area. Refer to Construction Drawings for information and details corresponding to the selected BMPs. Contractor will have a designated area for fuel storage and handling that is equipped with spill response tools for containment and fast clean up. All vehicle maintenance to be performed off site in an approved location.

Specific Pollution Prevention Practices

FUEL CONTAINMENT AREA	
Description: Above grade area created using straw bales and 10 mil plastic lining. Operator is required to be present during any fueling operation - if spill occurs then clean-up procedures will be initiated.	
Installation	DATE OF INSTALLATION: Before any fueling activities on site occur.
Maintenance Requirements	Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. Train employees and subcontractors in proper fueling and cleanup procedures. Dedicated fueling areas should be protected from stormwater runon and runoff and should be located at least 50 feet away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas. Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
Design Specifications	See Construction Drawings and Details

5.4 Washing of Equipment and Vehicles

General

- Washing of equipment and vehicles is not expected as part of this project but if needed:
- The washing of equipment and vehicles practice that will be implemented to minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of wash waters will be a Washing Area

Specific Pollution Prevention Practices

WASHING AREA	
Description: Above grade area created for washing vehicles with water only.	
Installation	DATE OF INSTALLATION: Before any washing of vehicles occurs.
Maintenance Requirements	Equipment and vehicles contaminated with fuel, oil, and/or other hazardous materials shall not be washed on site. Detergents/Solvents are not to be used on site.
Design Specifications	See Construction Drawings and Details

5.5 Storage, Handling, and Disposal of Construction Products, Materials, and Wastes

5.5.1 Building Products

General

- All building products shall be stored in appropriate laydown areas out of pedestrian and vehicle pathways. Building materials and products shall be covered to minimize exposure to precipitation and stormwater.

Specific Pollution Prevention Practices

STORAGE, HANDLING, AND DISPOSAL OF BUILDING PRODUCTS, MATERIALS, AND WASTES	
Description: All building materials to be stored, handled and disposed of in a manner to prevent pollutants from reaching storm water. All waste material will be placed in appropriate waste containers and managed per applicable state and federal requirements.	
Installation	DATE OF INSTALLATION:
Maintenance Requirements	All storage areas to be inspected on a regular basis to ensure proper function and housekeeping.
Design Specifications	As determined by contractor.

5.5.2 Pesticides, Herbicides, Insecticides, Fertilizers, and Landscape Materials

General

- No pesticides, herbicides, insecticides, or fertilizers are planned for this project.

Specific Pollution Prevention Practices

N/A

5.5.3 Diesel Fuel, Oil, Hydraulic Fluids, Other Petroleum Products, and Other Chemicals

General

- Diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals shall be stored in water-tight containers and provided with cover to minimize the exposure of the containers to precipitation and stormwater. All spills shall be cleaned up immediately, using dry clean-up methods where possible. Dispose of used and waste materials properly. The contractor is prohibited from hosing down the area to clean surfaces or spills.

Specific Pollution Prevention Practices

FUEL CONTAINMENT AREA	
Description: Above grade area created using straw bales and 10 mil plastic lining. Operator is required to be present during any fueling operation - if spill occurs then clean-up procedures will be initiated.	
Installation	DATE OF INSTALLATION: Before any fueling activities on site occur.
Maintenance Requirements	Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. Train employees and subcontractors in proper fueling and cleanup procedures. Dedicated fueling areas should be protected from stormwater runon and runoff and should be located at least 50 feet away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas. Vehicles and

	equipment should be inspected each day of use for leaks. Leaks should be repaired immediately, or problem vehicles or equipment should be removed from the project site.
Design Specifications	See Construction Drawings and Details

5.5.4 Hazardous or Toxic Waste

General

- Construction contractors shall provide means and methods for storing and handling hazardous materials on site. These methods are intended to prevent accidental spills from contaminating storm water and area soils and to facilitate prompt clean out. These methods may include double containment, impervious surfaces, absorbing mats and / or perimeter berms. Contractor will notify the site spill response team in the event that a leak is detected to ensure proper clean out or remediation is implemented immediately. A very minimum amount of hazardous or toxic waste is expected. Contractor shall handle and dispose of all toxic or hazardous substances in strict compliance with EPA and applicable local jurisdiction regulations. Covered and leak-proof containers are planned for disposal of hazardous or petroleum wastes.

Specific Pollution Prevention Practices

- As determined by the Contractor.

5.5.5 Construction and Domestic Waste

General

- Waste bin will be available on site to dispose of general construction waste. Contractor will be responsible for providing and emptying the waste bin. Whenever possible, covered and leak-proof containers are planned for disposal of debris and trash. The site best management practice is that disposal of chemical liquids into general construction waste bins is not allowed. All liquid disposal will be coordinated through the site waste coordinator to ensure proper disposal.

Specific Pollution Prevention Practices

SOLID WASTE CONTAINERS	
Description: All waste material will be placed in appropriate waste containers and managed per state and federal requirements.	
Installation	DATE OF INSTALLATION: Before waste materials accumulate.
Maintenance Requirements	All waste containers to be inspected on a regular basis to ensure proper function and housekeeping.
Design Specifications	As determined by Contractor

5.5.6 Sanitary Waste

General

- Portable toilets will be installed so that they are secure and will not be tipped or knocked over. They will be located away from waters of the US and stormwater inlets or conveyances.

Specific Pollution Prevention Practices

PORTABLE SANITARY WASTE CONTAINERS	
Description: Contract a service to pump out porta-potties and manage waste per state and federal regulatory requirements.	
Installation	DATE OF INSTALLATION: Prior to deployment of Contractor's employees to the project site.
Maintenance Requirements	All sanitary portable toilets and collection tanks to be inspected and emptied on a contract basis to ensure proper function and maintenance.
Design Specifications	As determined by Contractor

5.6 Washing of Applicators and Containers used for Paint, Concrete or Other Materials

General

- All washing of applicators and containers used for paint, concrete, or other materials shall direct wash waters into a leak-proof container or leak-proof and lined pit designed so that no overflows can occur due to inadequate sizing or precipitation. Contactor shall not dump liquid wastes in storm sewers or waters of the US and shall remove and dispose of hardened concrete waste consistent of waste disposal.

Specific Pollution Prevention Practices

CONCRETE WASHOUT AREA	
Description: Above grade area created using straw bales and 10 mil plastic lining. Operator is required to be present during washout operation.	
Installation	DATE OF INSTALLATION: Before concrete operations begin.
Maintenance Requirements	Inspect at least once per seven calendar days, or within a reasonable time period (not to exceed 48 hours) of a rainfall event which causes stormwater runoff to occur onsite. Remove and disposed of hardened concrete and return the facility to a functional condition. Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
Design Specifications	See Construction Drawings.

5.7 Fertilizers

General

- No fertilizers are planned for this project.

Specific Pollution Prevention Practices

N/A

5.8 Other Pollution Prevention Practices

General

- N/A

Specific Pollution Prevention Practices

- N/A

SECTION 6: INSPECTION AND CORRECTIVE ACTION

6.1 Inspection Personnel and Procedures

Personnel Responsible for Inspections

Ronald Gregory

Note: All personnel conducting inspections must be considered a "qualified person." CGP Part 4.1.1 clarifies that a "qualified person" is a person knowledgeable in the principles and practices of erosion and sediment controls and pollution prevention, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

Inspection Schedule

Specific Inspection Frequency

Standard Frequency:
☐ Every 7 days ☒ Every 14 days and within 24 hours of a 0.25" rain or the occurrence of runoff from snowmelt sufficient enough to cause a discharge
Increased Frequency (if applicable):
For areas of sites discharging to sediment or nutrient-impaired waters or to waters designated as Tier 2, Tier 2.5, or Tier 3 ☒ Every 7 days and within 24 hours of a 0.25" rain
Reduced Frequency (if applicable)
For stabilized areas ☒ Twice during first month, no more than 14 calendar days apart; then once per month after first month; ▪ Stabilized Areas: ▪ Date That They Were Completed:
For stabilized areas on "linear construction sites" ☐ Twice during first month, no more than 14 calendar days apart; then once more within 24 hours of a 0.25" rain ▪ N/A
For arid, semi-arid, or drought-stricken areas during seasonally dry periods or during drought ☐ Once per month and within 24 hours of a 0.25" rain ▪ N/A
For frozen conditions where earth-disturbing activities are being conducted ☐ Once per month ▪ N/A

Rain Gauge Location (if applicable)

Specify Location of Rain Gauge:
Rain gauge shall be located near construction facilities where it can be effectively monitored after every rainfall event and to not negatively affect its accuracy (not under awnings, on the side of buildings, equipment etc.)

Inspection Report Forms
See Appendix D

6.2 Corrective Action

Personnel Responsible for Corrective Actions
General Contractor/Operator

Corrective Action Forms
See Appendix E

6.3 Delegation of Authority

Duly Authorized Representative(s) or Position(s):

Big Rivers Electric Company
Ronald Gregory
Project Manager
5663 KY-85
Centertown, KY 42328
[redacted]
[redacted]

SECTION 7: TRAINING

Table 7-1: Documentation for Completion of Training

Name	Date Training Completed

SECTION 8: CERTIFICATION AND NOTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: Brent Hanley Title: Lead Civil Engineer

Signature: Brent Thomas Hanley Date: 21May2021

Name: Ronald Gregory Title: Project Manager

Signature: _____ Date: _____

SWPPP APPENDICES

Attach the following documentation to the SWPPP:

Appendix A – Site Maps

Appendix B – Copy of 2017 CGP

Appendix C – NOI

Appendix D – Inspection Form

Appendix E – Corrective Action Form

Appendix F – SWPPP Amendment Log

Appendix G – Subcontractor Certifications/Agreements

Appendix H – Grading and Stabilization Activities Log

Appendix I – SWPPP Training Log

Appendix J – Delegation of Authority Form

Appendix K – Endangered Species Documentation

Appendix L – Historic Properties Documentation

Appendix M – Rainfall Gauge Recording

Appendix A – Site Maps

CONFIDENTIAL

Filed with Motion for Confidential Treatment

Appendix B – Copy of 2012 CGP

National Pollutant Discharge Elimination System
General Permit for Discharges from
Construction Activities
(as modified)

In compliance with the provisions of the Clean Water Act, 33 U.S.C. §1251 et. seq., (hereafter CWA), as amended by the Water Quality Act of 1987, P.L. 100-4, "operators" of construction activities (defined in Appendix A) that meet the requirements of Part 1.1 of this National Pollutant Discharge Elimination System (NPDES) general permit, are authorized to discharge pollutants in accordance with the effluent limitations and conditions set forth herein. Permit coverage is required from the "commencement of construction activities" (see Appendix A) until one of the conditions for terminating CGP coverage has been met (see Part 8.2).

This permit becomes effective on **June 27, 2019**.

This permit and the authorization to discharge expire at 11:59pm, **February 16, 2022.**

Signed and issued this 14th day of May 2019

Deborah Szaro,
Acting Regional Administrator, EPA Region 1.

Signed and issued this 14th day of May 2019

Jeff Gratz,
Deputy Director, Water Division, EPA Region 2.

Signed and issued this 14th day of May 2019

Jose C. Font,
Acting Director, Caribbean Environmental Protection Division, EPA Region 2.

Signed and issued this 14th day of May 2019

Catharine McManus,
Deputy Director, Water Division, EPA Region 3.

Signed and issued this 14th day of May 2019

Jeaneanne M. Gettle,
Director, Water Division, EPA Region 4.

Signed and issued this 14th day of May 2019

Joan M. Tanaka,
Acting Director, Water Division, EPA Region 5.

Signed and issued this 14th day of May 2019

Charles W. Maguire,
Director, Water Division, EPA Region 6.

Signed and issued this 14th day of May 2019

Jeffery Robichaud,
Director, Water Division, EPA Region 7.

Signed and issued this 14th day of May 2019

Darcy O'Connor,
Director, Water Division, EPA Region 8.

Signed and issued this 14th day of May 2019

Tomás Torres,
Director, Water Division, EPA Region 9.

Signed and issued this 14th day of May 2019

Daniel D. Opalski,
Director, Water Division, EPA Region 10.

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1 HOW TO OBTAIN COVERAGE UNDER THE CONSTRUCTION GENERAL PERMIT (CGP)

To be covered under this permit, you must meet the eligibility conditions and follow the requirements for obtaining permit coverage in this Part.

1.1 ELIGIBILITY CONDITIONS

1.1.1 You are an "operator" of a construction site for which discharges will be covered under this permit. For the purposes of this permit and in the context of stormwater discharges associated with construction activity, an "operator" is any party associated with a construction project that meets either of the following two criteria:

a. The party has operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or

b. The party has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit conditions.

Where there are multiple operators associated with the same project, all operators must obtain permit coverage.[1] Subcontractors generally are not considered operators for the purposes of this permit.

1.1.2 Your site's construction activities:

a. Will disturb one or more acres of land, or will disturb less than one acre of land but are part of a common plan of development or sale that will ultimately disturb one or more acres of land; or

b. Have been designated by EPA as needing permit coverage under 40 CFR 122.26(a)(1)(v) or 40 CFR 122.26(b)(15)(ii);

1.1.3 Your site is located in an area where EPA is the permitting authority (see Appendix B);

1.1.4 Discharges from your site are not:

a. Already covered by a different NPDES permit for the same discharge; or

b. In the process of having coverage under a different NPDES permit for the same discharge denied, terminated, or revoked.[2, 3]

1.1.5 You are able to demonstrate that you meet one of the criteria listed in Appendix D with respect to the protection of species that are federally listed as endangered or threatened under the Endangered Species Act (ESA) and federally designated critical habitat;

1.1.6 You have completed the screening process in Appendix E relating to the protection of historic properties; and

[1] If the operator of a "construction support activity" (see Part 1.2.1c) is different than the operator of the main site, that operator must also obtain permit coverage. See Part 7.1 for clarification on the sharing of permit-related functions between and among operators on the same site and for conditions that apply to developing a SWPPP for multiple operators associated with the same site.

[2] Parts 1.1.4a and 1.1.4b do not include sites currently covered under the 2012 CGP that are in the process of obtaining coverage under this permit, nor sites covered under this permit that are transferring coverage to a different operator.

[3] Notwithstanding a site being made ineligible for coverage under this permit because it falls under the description of Parts 1.1.4a or 1.1.4b, above, EPA may waive the applicable eligibility requirement after specific review if it determines that coverage under this permit is appropriate.

1.1.7 You have complied with all requirements in Part 9 imposed by the applicable state, Indian tribe, or territory in which your construction activities and/or discharge will occur.

1.1.8 For "new sources" (as defined in Appendix A) only:

a. EPA has not, prior to authorization under this permit, determined that discharges from your site will cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard. Where such a determination is made prior to authorization, EPA may notify you that an individual permit application is necessary. However, EPA may authorize your coverage under this permit after you have included appropriate controls and implementation procedures designed to bring your discharge into compliance with this permit, specifically the requirement to meet water quality standards. In the absence of information demonstrating otherwise, EPA expects that compliance with the requirements of this permit, including the requirements applicable to such discharges in Part 3, will result in discharges that will not cause, have the reasonable potential to cause, or contribute to an excursion above any applicable water quality standard.

b. Discharges from your site to a Tier 2, Tier 2.5, or Tier 3 water[4] will not lower the water quality of the applicable water. In the absence of information demonstrating otherwise, EPA expects that compliance with the requirements of this permit, including the requirements applicable to such discharges in Part 3.2, will result in discharges that will not lower the water quality of such waters.

1.1.9 If you plan to add "cationic treatment chemicals" (as defined in Appendix A) to stormwater and/or authorized non-stormwater prior to discharge, you may not submit your Notice of Intent (NOI) unless and until you notify your applicable EPA Regional Office (see Appendix L) in advance and the EPA Regional Office authorizes coverage under this permit after you have included appropriate controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to discharges that cause an exceedance of water quality standards.

1.2 TYPES OF DISCHARGES AUTHORIZED[5]

1.2.1 The following stormwater discharges are authorized under this permit provided that appropriate stormwater controls are designed, installed, and maintained (see Parts 2 and 3):

a. Stormwater discharges, including stormwater runoff, snowmelt runoff, and surface runoff and drainage, associated with construction activity under 40 CFR 122.26(b)(14) or 122.26(b)(15)(i);

b. Stormwater discharges designated by EPA as needing a permit under 40 CFR 122.26(a)(1)(v) or 122.26(b)(15)(ii);

[4] Note: Your site will be considered to discharge to a Tier 2, Tier 2.5, or Tier 3 water if the first water to which you discharge is identified by a state, tribe, or EPA as a Tier 2, Tier 2.5, or Tier 3 water. For discharges that enter a storm sewer system prior to discharge, the first water of the U.S. to which you discharge is the waterbody that receives the stormwater discharge from the storm sewer system. See list of Tier 2, Tier 2.5, and Tier 3 waters in Appendix F.

[5] See "Discharge" as defined in Appendix A. Note: Any discharges not expressly authorized in this permit cannot become authorized or shielded from liability under CWA section 402(k) by disclosure to EPA, state, or local authorities after issuance of this permit via any means, including the Notice of Intent (NOI) to be covered by the permit, the SWPPP, or during an inspection.

c. Stormwater discharges from construction support activities *(e.g., concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, borrow areas)* provided that:

   i. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges;

   ii. The support activity is not a commercial operation, nor does it serve multiple unrelated construction sites;

   iii. The support activity does not continue to operate beyond the completion of the construction activity at the site it supports; and

   iv. Stormwater controls are implemented in accordance with Part 2 and Part 3 for discharges from the support activity areas.

d. Stormwater discharges from earth-disturbing activities associated with the construction of staging areas and the construction of access roads conducted prior to active mining.

1.2.2 The following non-stormwater discharges associated with your construction activity are authorized under this permit provided that, with the exception of water used to control dust and to irrigate vegetation in stabilized areas, these discharges are not routed to areas of exposed soil on your site and you comply with any applicable requirements for these discharges in Parts 2 and 3:

a. Discharges from emergency fire-fighting activities;

b. Fire hydrant flushings;

c. Landscape irrigation;

d. Water used to wash vehicles and equipment, provided that there is no discharge of soaps, solvents, or detergents used for such purposes;

e. Water used to control dust;

f. Potable water including uncontaminated water line flushings;

g. External building washdown, provided soaps, solvents, and detergents are not used, and external surfaces do not contain hazardous substances (as defined in Appendix A) *(e.g., paint or caulk containing polychlorinated biphenyls (PCBs)*);

h. Pavement wash waters, provided spills or leaks of toxic or hazardous substances have not occurred (unless all spill material has been removed) and where soaps, solvents, and detergents are not used. You are prohibited from directing pavement wash waters directly into any water of the U.S., storm drain inlet, or stormwater conveyance, unless the conveyance is connected to a sediment basin, sediment trap, or similarly effective control;

i. Uncontaminated air conditioning or compressor condensate;

j. Uncontaminated, non-turbid discharges of ground water or spring water;

k. Foundation or footing drains where flows are not contaminated with process materials such as solvents or contaminated ground water; and

l. Construction dewatering water discharged in accordance with Part 2.4.

1.2.3 Also authorized under this permit are discharges of stormwater listed above in Part 1.2.1, or authorized non-stormwater discharges listed above in Part 1.2.2, commingled with a

discharge authorized by a different NPDES permit and/or a discharge that does not require NPDES permit authorization.

1.3 PROHIBITED DISCHARGES[6]

1.3.1 Wastewater from washout of concrete, unless managed by an appropriate control as described in Part 2.3.4;

1.3.2 Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials;

1.3.3 Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance;

1.3.4 Soaps, solvents, or detergents used in vehicle and equipment washing or external building washdown; and

1.3.5 Toxic or hazardous substances from a spill or other release.

To prevent the above-listed prohibited non-stormwater discharges, operators must comply with the applicable pollution prevention requirements in Part 2.3.

1.4 SUBMITTING YOUR NOTICE OF INTENT (NOI)

All "operators" (as defined in Appendix A) associated with your construction site, who meet the Part 1.1 eligibility requirements, and who seek coverage under this permit, must submit to EPA a complete and accurate NOI in accordance with the deadlines in **Table 1** prior to commencing construction activities.

Exception: If you are conducting construction activities in response to a public emergency *(e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services)*, and the related work requires immediate authorization to avoid imminent endangerment to human health, public safety, or the environment, or to reestablish essential public services, you may discharge on the condition that a complete and accurate NOI is submitted within 30 calendar days after commencing construction activities (see Table 1) establishing that you are eligible for coverage under this permit. You must also provide documentation in your Stormwater Pollution Prevention Plan (SWPPP) to substantiate the occurrence of the public emergency.

1.4.1 Prerequisite for Submitting Your NOI

You must develop a SWPPP consistent with Part 7 before submitting your NOI for coverage under this permit.

1.4.2 How to Submit Your NOI

You must use EPA's NPDES eReporting Tool (NeT) to electronically prepare and submit your NOI for coverage under the 2017 CGP, unless you received a waiver from your EPA Regional Office.

To access NeT, go to https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting.

Waivers from electronic reporting may be granted based on one of the following conditions:

[6] EPA includes these prohibited non-stormwater discharges here as a reminder to the operator that the only non-stormwater discharges authorized by this permit are at Part 1.2.2. Any unauthorized non-stormwater discharges must be covered under an individual permit or alternative general permit.

a. If your operational headquarters is physically located in a geographic area (*i.e., ZIP code or census tract*) that is identified as under-served for broadband Internet access in the most recent report from the Federal Communications Commission; or

b. If you have limitations regarding available computer access or computer capability.

If the EPA Regional Office grants you approval to use a paper NOI, and you elect to use it, you must complete the form in Appendix J.

1.4.3 Deadlines for Submitting Your NOI and Your Official Date of Permit Coverage

Table 1 provides the deadlines for submitting your NOI and the official start date of your permit coverage, which differ depending on when you commence construction activities.

Table 1 NOI Submittal Deadlines and Official Start Date for Permit Coverage.

Type of Operator	NOI Submittal Deadline[7]	Permit Authorization Date[8]
Operator of a new site (*i.e., a site where construction activities commence on or after February 16, 2017*)	At least 14 calendar days before commencing construction activities.	14 calendar days after EPA notifies you that it has received a complete NOI, unless EPA notifies you that your authorization is delayed or denied.
Operator of an existing site *(i.e., a site with 2012 CGP coverage where construction activities commenced prior to February 16, 2017*)	No later than **May 17, 2017**.	
New operator of a permitted site (*i.e., an operator that through transfer of ownership and/or operation replaces the operator of an already permitted construction site that is either a "new site" or an "existing site"*)	At least 14 calendar days before the date the transfer to the new operator will take place.	
Operator of an "emergency-related project" (*i.e., a project initiated in response to a public emergency (e.g., mud slides, earthquake, extreme flooding conditions, disruption in essential public services), for which the related work requires immediate authorization to avoid imminent endangerment to human health or the environment, or to reestablish essential public services*)	No later than 30 calendar days after commencing construction activities.	You are considered provisionally covered under the terms and conditions of this permit immediately, and fully covered 14 calendar days after EPA notifies you that it has received a complete NOI, unless EPA notifies you that your authorization is delayed or denied.

1.4.4 Modifying your NOI

[7] If you miss the deadline to submit your NOI, any and all discharges from your construction activities will continue to be unauthorized under the CWA until they are covered by this or a different NPDES permit. EPA may take enforcement action for any unpermitted discharges that occur between the commencement of construction activities and discharge authorization.

[8] Discharges are not authorized if your NOI is incomplete or inaccurate or if you are not eligible for permit coverage.

If after submitting your NOI you need to correct or update any fields, you may do so by submitting a "Change NOI" form using NeT. Waivers from electronic reporting may be granted as specified in Part 1.4.1. If the EPA Regional Office has granted you approval to submit a paper NOI modification, you may indicate any NOI changes on the same NOI form in Appendix J.

When there is a change to the site's operator, the new operator must submit a new NOI, and the previous operator must submit a Notice of Termination (NOT) form as specified in Part 8.3.

1.4.5 Your Official End Date of Permit Coverage

Once covered under this permit, your coverage will last until the date that:

a. You terminate permit coverage consistent with Part 8; or

b. You receive permit coverage under a different NPDES permit or a reissued or replacement version of this permit after expiring on February 16, 2022; or

c. You fail to submit an NOI for coverage under a revised or replacement version of this permit before the deadline for existing construction sites where construction activities continue after this permit has expired.

1.5 REQUIREMENT TO POST A NOTICE OF YOUR PERMIT COVERAGE

You must post a sign or other notice of your permit coverage at a safe, publicly accessible location in close proximity to the construction site. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way.[9] At a minimum, the notice must include:

a. The NPDES ID (*i.e., permit tracking number assigned to your NOI*);

b. A contact name and phone number for obtaining additional construction site information;

c. The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional Office at [*include the appropriate CGP Regional Office contact information found at https://www.epa.gov/npdes/contact-us-stormwater#regional*];" and

d. The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

2 TECHNOLOGY-BASED EFFLUENT LIMITATIONS

You must comply with the following technology-based effluent limitations in this Part for all authorized discharges.[10]

[9] If the active part of the construction site is not visible from a public road, then place the notice of permit coverage in a position that is visible from the nearest public road and as close as possible to the construction site.

[10] For each of the effluent limits in Part 2, as applicable to your site, you must include in your SWPPP (1) a description of the specific control(s) to be implemented to meet the effluent limit; (2) any applicable design specifications; (3) routine maintenance specifications; and (4) the projected schedule for its (their)

2.1 GENERAL STORMWATER CONTROL DESIGN, INSTALLATION, AND MAINTENANCE REQUIREMENTS

You must design, install, and maintain stormwater controls required in Parts 2.2 and 2.3 to minimize the discharge of pollutants in stormwater from construction activities. To meet this requirement, you must:

2.1.1 Account for the following factors in designing your stormwater controls:

a. The expected amount, frequency, intensity, and duration of precipitation;

b. The nature of stormwater runoff and run-on at the site, including factors such as expected flow from impervious surfaces, slopes, and site drainage features. You must design stormwater controls to control stormwater volume, velocity, and peak flow rates to minimize discharges of pollutants in stormwater and to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points; and

c. The soil type and range of soil particle sizes expected to be present on the site.

2.1.2 Design and install all stormwater controls in accordance with good engineering practices, including applicable design specifications.[11]

2.1.3 Complete installation of stormwater controls by the time each phase of construction activities has begun.

a. By the time construction activity in any given portion of the site begins, install and make operational any downgradient sediment controls (*e.g., buffers, perimeter controls, exit point controls, storm drain inlet protection*) that control discharges from the initial site clearing, grading, excavating, and other earth-disturbing activities.[12]

b. Following the installation of these initial controls, install and make operational all stormwater controls needed to control discharges prior to subsequent earth-disturbing activities.

2.1.4 Ensure that all stormwater controls are maintained and remain in effective operating condition during permit coverage and are protected from activities that would reduce their effectiveness.

a. Comply with any specific maintenance requirements for the stormwater controls listed in this permit, as well as any recommended by the manufacturer.[13]

b. If at any time you find that a stormwater control needs routine maintenance, you must immediately initiate the needed maintenance work, and complete such work by the close of the next business day.

---

installation/implementation. See Part 7.2.6.

[11] Design specifications may be found in manufacturer specifications and/or in applicable erosion and sediment control manuals or ordinances. Any departures from such specifications must reflect good engineering practices and must be explained in your SWPPP. You must also comply with any additional design and installation requirements specified for the effluent limits in Parts 2.2 and 2.3.

[12] Note that the requirement to install stormwater controls prior to each phase of construction activities for the site does not apply to the earth disturbance associated with the actual installation of these controls. Operators should take all reasonable actions to minimize the discharges of pollutants during the installation of stormwater controls.

[13] Any departures from such maintenance recommendations made by the manufacturer must reflect good engineering practices and must be explained in your SWPPP.

c. If at any time you find that a stormwater control needs repair or replacement, you must comply with the corrective action requirements in Part 5.

2.2 EROSION AND SEDIMENT CONTROL REQUIREMENTS

You must implement erosion and sediment controls in accordance with the following requirements to minimize the discharge of pollutants in stormwater from construction activities.

2.2.1 Provide and maintain natural buffers and/or equivalent erosion and sediment controls when a water of the U.S. is located within 50 feet of the site's earth disturbances.

a. **Compliance Alternatives.** For any discharges to waters of the U.S. located within 50 feet of your site's earth disturbances, you must comply with one of the following alternatives:

   i. Provide and maintain a 50-foot undisturbed natural buffer; or

   ii. Provide and maintain an undisturbed natural buffer that is less than 50 feet and is supplemented by erosion and sediment controls that achieve, in combination, the sediment load reduction equivalent to a 50-foot undisturbed natural buffer; or

   iii. If infeasible to provide and maintain an undisturbed natural buffer of any size, implement erosion and sediment controls to achieve the sediment load reduction equivalent to a 50-foot undisturbed natural buffer.

   See Appendix G, Part G.2 for additional conditions applicable to each compliance alternative.

b. **Exceptions.** See Appendix G, Part G.2 for exceptions to the compliance alternatives.

2.2.2 Direct stormwater to vegetated areas and maximize stormwater infiltration and filtering to reduce pollutant discharges, unless infeasible.

2.2.3 Install sediment controls along any perimeter areas of the site that will receive pollutant discharges.[14]

a. Remove sediment before it has accumulated to one-half of the above-ground height of any perimeter control.

b. **Exception**. For areas at "linear construction sites" (as defined in Appendix A) where perimeter controls are infeasible *(e.g., due to a limited or restricted right-of-way),* implement other practices as necessary to minimize pollutant discharges to perimeter areas of the site.

2.2.4 Minimize sediment track-out.

a. Restrict vehicle use to properly designated exit points;

b. Use appropriate stabilization techniques[15] at all points that exit onto paved roads.

[14] Examples of perimeter controls include filter berms, silt fences, vegetative strips, and temporary diversion dikes.

[15] Examples of appropriate stabilization techniques include the use of aggregate stone with an underlying geotextile or non-woven filter fabric, and turf mats.

i. **Exception**: Stabilization is not required for exit points at linear utility construction sites that are used only episodically and for very short durations over the life of the project, provided other exit point controls[16] are implemented to minimize sediment track-out;

c. Implement additional track-out controls[17] as necessary to ensure that sediment removal occurs prior to vehicle exit; and

d. Where sediment has been tracked-out from your site onto paved roads, sidewalks, or other paved areas outside of your site, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. You are prohibited from hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S.[18]

2.2.5 Manage stockpiles or land clearing debris piles composed, in whole or in part, of sediment and/or soil:

a. Locate the piles outside of any natural buffers established under Part 2.2.1 and away from any stormwater conveyances, drain inlets, and areas where stormwater flow is concentrated;

b. Install a sediment barrier along all downgradient perimeter areas;[19]

c. For piles that will be unused for 14 or more days, provide cover[20] or appropriate temporary stabilization (consistent with Part 2.2.14);

d. You are prohibited from hosing down or sweeping soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or water of the U.S.

2.2.6 Minimize dust. On areas of exposed soil, minimize dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged in stormwater from the site.

2.2.7 Minimize steep slope disturbances. Minimize the disturbance of "steep slopes" (as defined in Appendix A).

[16] Examples of other exit point controls include preventing the use of exit points during wet periods; minimizing exit point use by keeping vehicles on site to the extent possible; limiting exit point size to the width needed for vehicle and equipment usage; using scarifying and compaction techniques on the soil; and avoiding establishing exit points in environmentally sensitive areas *(e.g., karst areas; steep slopes)*.

[17] Examples of additional track-out controls include the use of wheel washing, rumble strips, and rattle plates.

[18] Fine grains that remain visible *(i.e., staining)* on the surfaces of off-site streets, other paved areas, and sidewalks after you have implemented sediment removal practices are not a violation of Part 2.2.4.

[19] Examples of sediment barriers include berms, dikes, fiber rolls, silt fences, sandbags, gravel bags, or straw bale.

[20] Examples of cover include tarps, blown straw and hydroseeding.

2.2.8 Preserve native topsoil, unless infeasible.[21]

2.2.9 Minimize soil compaction.[22] In areas of your site where final vegetative stabilization will occur or where infiltration practices will be installed:

a. Restrict vehicle and equipment use in these locations to avoid soil compaction; and

b. Before seeding or planting areas of exposed soil that have been compacted, use techniques that rehabilitate and condition the soils as necessary to support vegetative growth.

2.2.10 Protect storm drain inlets.

a. Install inlet protection measures that remove sediment from discharges prior to entry into any storm drain inlet that carries stormwater flow from your site to a water of the U.S., provided you have authority to access the storm drain inlet;[23] and

b. Clean, or remove and replace, the protection measures as sediment accumulates, the filter becomes clogged, and/or performance is compromised. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, remove the deposited sediment by the end of the same business day in which it is found or by the end of the following business day if removal by the same business day is not feasible.

2.2.11 Control stormwater discharges, including both peak flowrates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of discharge points. [24].

2.2.12 If you install a sediment basin or similar impoundment:

a. Situate the basin or impoundment outside of any water of the U.S. and any natural buffers established under Part 2.2.1;

b. Design the basin or impoundment to avoid collecting water from wetlands;

c. Design the basin or impoundment to provide storage for either:

   i. The calculated volume of runoff from a 2-year, 24-hour storm (see Appendix H); or

   ii. 3,600 cubic feet per acre drained.

[21] Stockpiling topsoil at off-site locations, or transferring topsoil to other locations, is an example of a practice that is consistent with the requirements in Part 2.2.8. Preserving native topsoil is not required where the intended function of a specific area of the site dictates that the topsoil be disturbed or removed. For example, some sites may be designed to be highly impervious after construction, and therefore little or no vegetation is intended to remain, or may not have space to stockpile native topsoil on site for later use, in which case, it may not be feasible to preserve topsoil.

[22] Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted.

[23] Inlet protection measures can be removed in the event of flood conditions or to prevent erosion.

[24] Examples of control measures that can be used to comply with this requirement include the use of erosion controls and/or velocity dissipation devices (e.g., check dams, sediment traps), within and along the length of a stormwater conveyance and at the outfall to slow down runoff.

d. Utilize outlet structures that withdraw water from the surface of the sediment basin or similar impoundment, unless infeasible;[25]

e. Use erosion controls and velocity dissipation devices to prevent erosion at inlets and outlets; and

f. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.

2.2.13 If using treatment chemicals (*e.g., polymers, flocculants, coagulants*):

a. **Use conventional erosion and sediment controls before and after the application of treatment chemicals.** Chemicals may only be applied where treated stormwater is directed to a sediment control *(e.g., sediment basin, perimeter control)* before discharge.

b. **Select appropriate treatment chemicals***.* Chemicals must be appropriately suited to the types of soils likely to be exposed during construction and present in the discharges being treated *(i.e., the expected turbidity, pH, and flow rate of stormwater flowing into the chemical treatment system or area)*.

c. **Minimize discharge risk from stored chemicals.** Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures *(e.g., spill berms, decks, spill containment pallets),* or provide equivalent measures designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means *(e.g., storing chemicals in a covered area, having a spill kit available on site and ensuring personnel are available to respond expeditiously in the event of a leak or spill)*.

d. **Comply with state/local requirements.** Comply with applicable state and local requirements regarding the use of treatment chemicals.

e. **Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier.** Use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the provider/supplier of the applicable chemicals, or document in your SWPPP specific departures from these specifications and how they reflect good engineering practice.

f. **Ensure proper training.** Ensure that all persons who handle and use treatment chemicals at the construction site are provided with appropriate, product-specific training. Among other things, the training must cover proper dosing requirements.

g. **Perform additional measures specified by the EPA Regional Office for the authorized use of cationic chemicals.** If you have been authorized to use cationic chemicals at your site pursuant to Part 1.1.9, you must perform all additional measures as conditioned by your authorization to ensure that the use of such chemicals will not cause an exceedance of water quality standards.

[25] The circumstances in which it is infeasible to design outlet structures in this manner are rare. Exceptions may include areas with extended cold weather, where using surface outlets may not be feasible during certain time periods (although they must be used during other periods). If you determine that it is infeasible to meet this requirement, you must provide documentation in your SWPPP to support your determination, including the specific conditions or time periods when this exception will apply.

2.2.14 Stabilize exposed portions of the site. Implement and maintain stabilization measures (*e.g., seeding protected by erosion controls until vegetation is established, sodding, mulching, erosion control blankets, hydromulch, gravel*) that minimize erosion from exposed portions of the site in accordance with Parts 2.2.14a and 2.2.14b.

a. **Stabilization Deadlines:**[26]

Total Amount of Land Disturbance Occurring At Any One Time[27]	**Deadline**
i. **Five acres or less (≤5.0)** **Note: this includes sites disturbing more than five acres (>5.0) total over the course of a project, but that limit disturbance at any one time *(i.e., phase the disturbance)* to five acres or less (≤5.0)**	• Initiate the installation of stabilization measures immediately[28] in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days;[29] and • Complete the installation of stabilization measures as soon as practicable, but no later than 14 calendar days after stabilization has been initiated.[30]

[26] EPA may determine, based on an inspection carried out under Part 4.8 and corrective actions required under Part 5.3, that the level of sediment discharge on the site makes it necessary to require a faster schedule for completing stabilization. For instance, if sediment discharges from an area of exposed soil that is required to be stabilized are compromising the performance of existing stormwater controls, EPA may require stabilization to correct this problem.

[27] Limiting disturbances to five (5) acres or less at any one time means that at no time during the project do the cumulative earth disturbances exceed five (5) acres. The following examples would qualify as limiting disturbances at any one time to five (5) acres or less:

1. The total area of disturbance for a project is five (5) acres or less.
2. The total area of disturbance for a project will exceed five (5) acres, but the operator ensures that no more than five (5) acres will be disturbed at any one time through implementation of stabilization measures. In this way, site stabilization can be used to "free up" land that can be disturbed without exceeding the five (5)-acre cap to qualify for the 14-day stabilization deadline. For instance, if an operator completes stabilization of two (2) acres of land on a five (5)-acre disturbance, then two (2) additional acres could be disturbed while still qualifying for the longer 14-day stabilization deadline.

[28] The following are examples of activities that would constitute the immediate initiation of stabilization:

1. Prepping the soil for vegetative or non-vegetative stabilization as long as seeding, planting, and/or installation of non-vegetative stabilization products takes place as soon as practicable, but no later than one (1) calendar day of completing soil preparation;
2. Applying mulch or other non-vegetative product to the exposed area;
3. Seeding or planting the exposed area;
4. Starting any of the activities in # 1 – 3 on a portion of the entire area that will be stabilized; and
5. Finalizing arrangements to have stabilization product fully installed in compliance with the deadlines for completing stabilization.

[29] The requirement to initiate stabilization immediately is triggered as soon as you know that construction work on a portion of the site is temporarily ceased and will not resume for 14 or more days, or as soon as you know that construction work is permanently ceased. In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next business day, following the day when the construction activities have temporarily or permanently ceased.

[30] If vegetative stabilization measures are being implemented, stabilization is considered "installed" when all activities necessary to seed or plant the area are completed. If non-vegetative stabilization measures are being implemented, stabilization is considered "installed" when all such measures are implemented or applied.

ii. **More than five acres (>5.0)**	• Initiate the installation of stabilization measures immediately[31] in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 14 or more calendar days;[32] and • Complete the installation of stabilization measures as soon as practicable, but no later than seven (7) calendar days after stabilization has been initiated.[33]

iii. **Exceptions:**

(a) Arid, semi-arid, and drought-stricken areas (as defined in Appendix A)**.** If it is the seasonally dry period or a period in which drought is occurring, and vegetative stabilization measures are being used:

(i) Immediately initiate and, within 14 calendar days of a temporary or permanent cessation of work in any portion of your site, complete the installation of temporary non-vegetative stabilization measures to the extent necessary to prevent erosion;

(ii) As soon as practicable, given conditions or circumstances on the site, complete all activities necessary to seed or plant the area to be stabilized; and

(iii) If construction is occurring during the seasonally dry period, indicate in your SWPPP the beginning and ending dates of the seasonally dry period and your site conditions. Also include the schedule you will follow for initiating and completing vegetative stabilization.

(b) Operators that are affected by unforeseen circumstances[34] that delay the initiation and/or completion of vegetative stabilization:

(i) Immediately initiate and, within 14 calendar days, complete the installation of temporary non-vegetative stabilization measures to prevent erosion;

(ii) Complete all soil conditioning, seeding, watering or irrigation installation, mulching, and other required activities related to the planting and initial establishment of vegetation as soon as conditions or circumstances allow it on your site; and

(iii) Document in the SWPPP the circumstances that prevent you from meeting the deadlines in Part 2.2.14a and the schedule you will follow for initiating and completing stabilization.

(c) Discharges to a sediment- or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes. Complete stabilization as soon as

[31] See footnote 27

[32] See footnote 28

[33] See footnote 29

[34] Examples include problems with the supply of seed stock or with the availability of specialized equipment and unsuitability of soil conditions due to excessive precipitation and/or flooding.

practicable, but no later than seven (7) calendar days after stabilization has been initiated.

b. **Final Stabilization Criteria** (for any areas not covered by permanent structures)**:**

i. Establish uniform, perennial vegetation *(i.e., evenly distributed, without large bare areas)* that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas; and/or

ii. Implement permanent non-vegetative stabilization measures[35] to provide effective cover.

iii. **Exceptions:**

(a) Arid, semi-arid, and drought-stricken areas (as defined in Appendix A). Final stabilization is met if the area has been seeded or planted to establish vegetation that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas within three (3) years and, to the extent necessary to prevent erosion on the seeded or planted area, non-vegetative erosion controls have been applied that provide cover for at least three years without active maintenance.

(b) Disturbed areas on agricultural land that are restored to their preconstruction agricultural use. The Part 2.2.14b final stabilization criteria does not apply.

***(c)* Areas that need to remain disturbed.** In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed, and only the minimum area needed remains disturbed *(e.g., dirt access roads, utility pole pads, areas being used for storage of vehicles, equipment, materials)*.

2.3 POLLUTION PREVENTION REQUIREMENTS[36]

You must implement pollution prevention controls in accordance with the following requirements to minimize the discharge of pollutants in stormwater and to prevent the discharge of pollutants from spilled or leaked materials from construction activities.

2.3.1 For equipment and vehicle fueling and maintenance:

a. Provide an effective means of eliminating the discharge of spilled or leaked chemicals, including fuels and oils, from these activities;[37]

[35] Examples of permanent non-vegetative stabilization measures include riprap, gravel, gabions, and geotextiles.

[36] Under this permit, you are not required to minimize exposure for any products or materials where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

[37] Examples of effective means include:
- Locating activities away from waters of the U.S. and stormwater inlets or conveyances so that stormwater coming into contact with these activities cannot reach waters of the U.S.;
- Providing secondary containment (*e.g., spill berms, decks, spill containment pallets*) and cover where appropriate; and
- Having a spill kit available on site and ensuring personnel are available to respond expeditiously in the event of a leak or spill.

b. If applicable, comply with the Spill Prevention Control and Countermeasures (SPCC) requirements in 40 CFR part 112 and Section 311 of the CWA;

c. Ensure adequate supplies are available at all times to handle spills, leaks, and disposal of used liquids;

d. Use drip pans and absorbents under or around leaky vehicles;

e. Dispose of or recycle oil and oily wastes in accordance with other federal, state, tribal, or local requirements; and

f. Clean up spills or contaminated surfaces immediately, using dry clean up measures (do not clean contaminated surfaces by hosing the area down), and eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge.

2.3.2 For equipment and vehicle washing:

a. Provide an effective means of minimizing the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other types of wash waters;[38]

b. Ensure there is no discharge of soaps, solvents, or detergents in equipment and vehicle wash water; and

c. For storage of soaps, detergents, or solvents, provide either (1) cover *(e.g., plastic sheeting, temporary roofs)* to minimize the exposure of these detergents to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.

2.3.3 For storage, handling, and disposal of building products, materials, and wastes:

a. *For building materials and building products*[39], provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these products to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas.

   Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

b. *For pesticides, herbicides, insecticides, fertilizers, and landscape materials*:

   i. In storage areas, provide either (1) cover (*e.g., plastic sheeting, temporary roofs*) to minimize the exposure of these chemicals to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas; and

   ii. Comply with all application and disposal requirements included on the registered pesticide, herbicide, insecticide, and fertilizer label (see also Part 2.3.5).

c. *For diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals*:

[38] Examples of effective means include locating activities away from waters of the U.S. and stormwater inlets or conveyances and directing wash waters to a sediment basin or sediment trap, using filtration devices, such as filter bags or sand filters, or using other similarly effective controls.

[39] Examples of building materials and building products typically present at construction sites include asphalt sealants, copper flashing, roofing materials, adhesives, concrete admixtures, and gravel and mulch stockpiles.

i. Store chemicals in water-tight containers, and provide either (1) cover *(e.g., plastic sheeting, temporary roofs)* to minimize the exposure of these containers to precipitation and to stormwater, or (2) a similarly effective means designed to minimize the discharge of pollutants from these areas *(e.g., having a spill kit available on site and ensuring personnel are available to respond expeditiously in the event of a leak or spill)*, or provide secondary containment *(e.g., spill berms, decks, spill containment pallets)*; and

ii. Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. You are prohibited from hosing the area down to clean surfaces or spills. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge.

d. *For hazardous or toxic wastes*:[40]

i. Separate hazardous or toxic waste from construction and domestic waste;

ii. Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements and all other applicable federal, state, tribal, or local requirements;

iii. Store all outside containers within appropriately-sized secondary containment (*e.g., spill berms, decks, spill containment pallets*) to prevent spills from being discharged, or provide a similarly effective means designed to prevent the discharge of pollutants from these areas *(e.g., storing chemicals in a covered area, having a spill kit available on site);*

iv. Dispose of hazardous or toxic waste in accordance with the manufacturer's recommended method of disposal and in compliance with federal, state, tribal, and local requirements;

v. Clean up spills immediately, using dry clean-up methods, and dispose of used materials properly. You are prohibited from hosing the area down to clean surfaces or spills. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge; and

vi. Follow all other federal, state, tribal, and local requirements regarding hazardous or toxic waste.

e. *For construction and domestic wastes*:[41]

i. Provide waste containers *(e.g., dumpster, trash receptacle)* of sufficient size and number to contain construction and domestic wastes;

ii. Keep waste container lids closed when not in use and close lids at the end of the business day for those containers that are actively used throughout the day. For waste containers that do not have lids, provide either (1) cover *(e.g., a tarp, plastic sheeting, temporary roof)* to minimize exposure of wastes to precipitation,

[40] Examples of hazardous or toxic waste that may be present at construction sites include paints, caulks, sealants, fluorescent light ballasts, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.

[41] Examples of construction and domestic waste include packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete, demolition debris; and other trash or building materials.

or (2) a similarly effective means designed to minimize the discharge of pollutants *(e.g., secondary containment)*;

iii. On business days, clean up and dispose of waste in designated waste containers; and

iv. Clean up immediately if containers overflow.

f. *For sanitary waste*, position portable toilets so that they are secure and will not be tipped or knocked over, and located away from waters of the U.S. and stormwater inlets or conveyances.

2.3.4 For washing applicators and containers used for stucco, paint, concrete, form release oils, curing compounds, or other materials:

a. Direct wash water into a leak-proof container or leak-proof and lined pit designed so that no overflows can occur due to inadequate sizing or precipitation;

b. Handle washout or cleanout wastes as follows:

i. Do not dump liquid wastes in storm sewers or waters of the U.S.;

ii. Dispose of liquid wastes in accordance with applicable requirements in Part 2.3.3; and

iii. Remove and dispose of hardened concrete waste consistent with your handling of other construction wastes in Part 2.3.3; and

c. Locate any washout or cleanout activities as far away as possible from waters of the U.S. and stormwater inlets or conveyances, and, to the extent feasible, designate areas to be used for these activities and conduct such activities only in these areas.

2.3.5 For the application of fertilizers:

a. Apply at a rate and in amounts consistent with manufacturer's specifications, or document in the SWPPP departures from the manufacturer specifications where appropriate in accordance with Part 7.2.6.b.ix;

b. Apply at the appropriate time of year for your location, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth;

c. Avoid applying before heavy rains that could cause excess nutrients to be discharged;

d. Never apply to frozen ground;

e. Never apply to stormwater conveyance channels; and

f. Follow all other federal, state, tribal, and local requirements regarding fertilizer application.

2.3.6 Emergency Spill Notification Requirements

Discharges of toxic or hazardous substances from a spill or other release are prohibited, consistent with Part 1.3.5. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302 occurs during a 24-hour period, you must notify the National Response Center (NRC) at (800) 424-8802 or, in the Washington, DC metropolitan area, call (202) 267-2675 in accordance with the requirements of 40 CFR 110, 40 CFR 117, and 40 CFR 302 as soon as you have knowledge of the release. You must also, within seven (7) calendar days of knowledge of the release, provide a

description of the release, the circumstances leading to the release, and the date of the release. State, tribal, or local requirements may necessitate additional reporting of spills or discharges to local emergency response, public health, or drinking water supply agencies.

2.4 CONSTRUCTION DEWATERING REQUIREMENTS

Comply with the following requirements to minimize the discharge of pollutants in ground water or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, in accordance with Part 1.2.2.[42]

2.4.1 Treat dewatering discharges with controls to minimize discharges of pollutants;[43]

2.4.2 Do not discharge visible floating solids or foam;

2.4.3 Use an oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove oil, grease, or other products if dewatering water is found to contain these materials;

2.4.4 To the extent feasible, use vegetated, upland areas of the site to infiltrate dewatering water before discharge. You are prohibited from using waters of the U.S. as part of the treatment area;

2.4.5 At all points where dewatering water is discharged, comply with the velocity dissipation requirements of Part 2.2.11;

2.4.6 With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and

2.4.7 Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.

3 WATER QUALITY-BASED EFFLUENT LIMITATIONS

3.1 GENERAL EFFLUENT LIMITATION TO MEET APPLICABLE WATER QUALITY STANDARDS

Discharges must be controlled as necessary to meet applicable water quality standards. Discharges must also comply with any additional state or tribal requirements that are in Part 9.

In the absence of information demonstrating otherwise, EPA expects that compliance with the conditions in this permit will result in stormwater discharges being controlled as necessary to meet applicable water quality standards. If at any time you become aware, or EPA determines, that discharges are not being controlled as necessary to meet applicable water quality standards, you must take corrective action as required in Parts 5.1 and 5.2, and document the corrective actions as required in Part 5.4.

[42] Uncontaminated, clear (non-turbid) dewatering water can be discharged without being routed to a control.

[43] Appropriate controls include sediment basins or sediment traps, sediment socks, dewatering tanks, tube settlers, weir tanks, filtration systems (*e.g., bag or sand filters*), and passive treatment systems that are designed to remove sediment. Appropriate controls to use downstream of dewatering controls to minimize erosion include vegetated buffers, check dams, riprap, and grouted riprap at outlets.

EPA may insist that you install additional controls (to meet the narrative water quality-based effluent limit above) on a site-specific basis, or require you to obtain coverage under an individual permit, if information in your NOI or from other sources indicates that your discharges are not controlled as necessary to meet applicable water quality standards. This includes situations where additional controls are necessary to comply with a wasteload allocation in an EPA-established or approved TMDL.

If during your coverage under a previous permit, you were required to install and maintain stormwater controls specifically to meet the assumptions and requirements of an EPA-approved or established TMDL (for any parameter) or to otherwise control your discharge to meet water quality standards, you must continue to implement such controls as part of your coverage under this permit.

3.2 DISCHARGE LIMITATIONS FOR SITES DISCHARGING TO SENSITIVE WATERS[44]

For any portion of the site that discharges to a sediment or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes, you must comply with the inspection frequency specified in 4.3 and you must comply with the stabilization deadline specified in Part 2.2.14.a.iii.(c).[45]

If you discharge to a water that is impaired for a parameter other than a sediment-related parameter or nutrients, EPA will inform you if any additional controls are necessary for your discharge to be controlled as necessary to meet water quality standards, including for it to be consistent with the assumptions of any available wasteload allocation in any applicable TMDL, or if coverage under an individual permit is necessary.

In addition, on a case-by-case basis, EPA may notify operators of new sites or operators of existing sites with increased discharges that additional analyses, stormwater controls, or other measures are necessary to comply with the applicable

[44] Sensitive waters include waters that are impaired and Tier 2, Tier 2.5, and Tier 3 waters.

"Impaired waters" are those waters identified by the state, tribe, or EPA as not meeting an applicable water quality standard and (1) requires development of a TMDL (pursuant to section 303(d) of the CWA; or (2) is addressed by an EPA-approved or established TMDL; or (3) is not in either of the above categories but the waterbody is covered by a pollution control program that meets the requirements of 40 CFR 130.7(b)(1). Your construction site will be considered to discharge to an impaired water if the first water of the U.S. to which you discharge is an impaired water for the pollutants contained in the discharge from your site. For discharges that enter a storm sewer system prior to discharge, the first water of the U.S. to which you discharge is the waterbody that receives the stormwater discharge from the storm sewer system. For assistance in determining whether your site discharges to impaired waters, EPA has developed a tool that is available both within the electronic NOI form in NeT, and at https://water.epa.gov/polwaste/npdes/stormwater/discharge.cfm.

Tiers 2, 2.5 and 3 refer to waters either identified by the state as high quality waters or Outstanding National Resource Waters under 40 CFR 131.12(a)(2) and (3). For the purposes of this permit, you are considered to discharge to a Tier 2, Tier 2.5, or Tier 3 water if the first water of the U.S. to which you discharge is identified by a state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3. For discharges that enter a storm sewer system prior to discharge, the water of the U.S. to which you discharge is the first water of the U.S. that receives the stormwater discharge from the storm sewer system. See list of Tier 2, Tier 2.5, and Tier 3 waters in Appendix F.

EPA may determine on a case-by-case basis that a site discharges to a sensitive water.

[45] If you qualify for any of the reduced inspection frequencies in Part 4.4, you may conduct inspections in accordance with Part 4.4 for any portion of your site that discharges to a sensitive water.

antidegradation requirements, or notify you that an individual permit application is necessary.

If you discharge to a water that is impaired for polychlorinated biphenyls (PCBs) and are engaging in demolition of any structure with at least 10,000 square feet of floor space built or renovated before January 1, 1980, you must:

a. Implement controls[46] to minimize the exposure of PCB-containing building materials, including paint, caulk, and pre-1980 fluorescent lighting fixtures, to precipitation and to stormwater; and

b. Ensure that disposal of such materials is performed in compliance with applicable state, federal, and local laws.

4 SITE INSPECTION REQUIREMENTS

4.1 PERSON(S) RESPONSIBLE FOR INSPECTING SITE

The person(s) inspecting your site may be a person on your staff or a third party you hire to conduct such inspections. You are responsible for ensuring that the person who conducts inspections is a "qualified person."[47]

4.2 FREQUENCY OF INSPECTIONS.[48]

At a minimum, you must conduct a site inspection in accordance with one of the two schedules listed below, unless you are subject to the Part 4.3 site inspection frequency for discharges to sensitive waters or qualify for a Part 4.4 reduction in the inspection frequency:

4.2.1 At least once every seven (7) calendar days; *or*

4.2.2 Once every 14 calendar days *and* within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge.[49] To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

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[46] Examples of controls to minimize exposure of PCBs to precipitation and stormwater include separating work areas from non-work areas and selecting appropriate personal protective equipment and tools, constructing a containment area so that all dust or debris generated by the work remains within the protected area, using tools that minimize dust and heat (<212°F). For additional information, refer to Part 2.3.3 of the CGP Fact Sheet.

[47] A "qualified person" is a person knowledgeable in the principles and practice of erosion and sediment controls and pollution prevention, who possesses the appropriate skills and training to assess conditions at the construction site that could impact stormwater quality, and the appropriate skills and training to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of this permit.

[48] Inspections are only required during the site's normal working hours.

[49] "Within 24 hours of the occurrence of a storm event" means that you must conduct an inspection within 24 hours once a storm event has produced 0.25 inches within a 24-hour period, even if the storm event is still continuing. Thus, if you have elected to inspect bi-weekly in accordance with Part 4.2.2 and there is a storm event at your site that continues for multiple days, and each day of the storm produces 0.25 inches or more of rain, you must conduct an inspection within 24 hours of the first day of the storm and within 24 hours after the end of the storm.

4.3 INCREASE IN INSPECTION FREQUENCY FOR SITES DISCHARGING TO SENSITIVE WATERS.

For any portion of the site that discharges to a sediment or nutrient-impaired water or to a water that is identified by your state, tribe, or EPA as Tier 2, Tier 2.5, or Tier 3 for antidegradation purposes (see Part 3.2), instead of the inspection frequency specified in Part 4.2, you must conduct inspections in accordance with the following inspection frequencies:

Once every seven (7) calendar days *and* within 24 hours of the occurrence of a storm event of 0.25 inches or greater, or the occurrence of runoff from snowmelt sufficient to cause a discharge. To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

4.4 REDUCTIONS IN INSPECTION FREQUENCY

4.4.1 Stabilized areas.

a. You may reduce the frequency of inspections to twice per month for the first month, no more than 14 calendar days apart, then once per month in any area of your site where the stabilization steps in 2.2.14a have been completed. If construction activity resumes in this portion of the site at a later date, the inspection frequency immediately increases to that required in Parts 4.2 and 4.3, as applicable. You must document the beginning and ending dates of this period in your SWPPP.

b. **Exception.** For "linear construction sites" (as defined in Appendix A) where disturbed portions have undergone final stabilization at the same time active construction continues on others, you may reduce the frequency of inspections to twice per month for the first month, no more than 14 calendar days apart, in any area of your site where the stabilization steps in 2.2.14a have been completed. After the first month, inspect once more within 24 hours of the occurrence of a storm event of 0.25 inches or greater. If there are no issues or evidence of stabilization problems, you may suspend further inspections. If "wash-out" of stabilization materials and/or sediment is observed, following re-stabilization, inspections must resume at the inspection frequency required in Part 4.4.1a Inspections must continue until final stabilization is visually confirmed following a storm event of 0.25 inches or greater.

4.4.2 Arid, semi-arid, or drought-stricken areas (as defined in Appendix A). If it is the seasonally dry period or a period in which drought is occurring, you may reduce the frequency of inspections to once per month and within 24 hours of the occurrence of a storm event of 0.25 inches or greater. You must document that you are using this reduced schedule and the beginning and ending dates of the seasonally dry period in your SWPPP. To determine if a storm event of 0.25 inches or greater has occurred on your site, you must either keep a properly maintained rain gauge on your site, or obtain the storm event information from a weather station that is representative of your location. For any day of rainfall during normal business hours that measures 0.25 inches or greater, you must record the total rainfall measured for that day in accordance with Part 4.7.1d.

4.4.3 Frozen conditions:

a. If you are suspending construction activities due to frozen conditions, you may temporarily suspend inspections on your site until thawing conditions (as defined in Appendix A) begin to occur if:

i. Runoff is unlikely due to continuous frozen conditions that are likely to continue at your site for at least three (3) months based on historic seasonal averages. If unexpected weather conditions (such as above freezing temperatures or rain events) make discharges likely, you must immediately resume your regular inspection frequency as described in Parts 4.2 and 4.3, as applicable;

ii. Land disturbances have been suspended; and

iii. All disturbed areas of the site have been stabilized in accordance with Part 2.2.14a.

b. If you are still conducting construction activities during frozen conditions, you may reduce your inspection frequency to once per month if:

i. Runoff is unlikely due to continuous frozen conditions that are likely to continue at your site for at least three (3) months based on historic seasonal averages. If unexpected weather conditions (such as above freezing temperatures or rain events) make discharges likely, you must immediately resume your regular inspection frequency as described in Parts 4.2 and 4.3, as applicable; and

ii. Except for areas in which you are actively conducting construction activities, disturbed areas of the site have been stabilized in accordance with Part 2.2.14a.

You must document the beginning and ending dates of this period in your SWPPP.

4.5 AREAS THAT MUST BE INSPECTED

During your site inspection, you must at a minimum inspect the following areas of your site:

4.5.1 All areas that have been cleared, graded, or excavated and that have not yet completed stabilization consistent with Part 2.2.14a;

4.5.2 All stormwater controls (including pollution prevention controls) installed at the site to comply with this permit;[50]

4.5.3 Material, waste, borrow, and equipment storage and maintenance areas that are covered by this permit;

4.5.4 All areas where stormwater typically flows within the site, including drainageways designed to divert, convey, and/or treat stormwater;

4.5.5 All points of discharge from the site; and

4.5.6 All locations where stabilization measures have been implemented.

You are not required to inspect areas that, at the time of the inspection, are considered unsafe to your inspection personnel.

4.6 REQUIREMENTS FOR INSPECTIONS

During your site inspection, you must at a minimum:

4.6.1 Check whether all stormwater controls *(i.e., erosion and sediment controls and pollution prevention controls)* are properly installed, appear to be operational, and are working as intended to minimize pollutant discharges;

[50] This includes the requirement to inspect for sediment that has been tracked out from the site onto paved roads, sidewalks, or other paved areas consistent with Part 2.2.4.

4.6.2 Check for the presence of conditions that could lead to spills, leaks, or other accumulations of pollutants on the site;

4.6.3 Identify any locations where new or modified stormwater controls are necessary to meet the requirements of Parts 2 and/or 3;

4.6.4 Check for signs of visible erosion and sedimentation *(i.e., sediment deposits)* that have occurred and are attributable to your discharge at points of discharge and, if applicable, the banks of any waters of the U.S. flowing within or immediately adjacent to the site;

4.6.5 Identify any incidents of noncompliance observed;

4.6.6 If a discharge is occurring during your inspection:

a. Identify all discharge points at the site; and

b. Observe and document the visual quality of the discharge, and take note of the characteristics of the stormwater discharge, including color; odor; floating, settled, or suspended solids; foam; oil sheen; and other indicators of stormwater pollutants.

4.6.7 Based on the results of your inspection, complete any necessary maintenance under Part 2.1.4 and corrective action under Part 5.

4.7 INSPECTION REPORT

4.7.1 You must complete an inspection report within 24 hours of completing any site inspection. Each inspection report must include the following:

a. The inspection date;

b. Names and titles of personnel making the inspection;

c. A summary of your inspection findings, covering at a minimum the observations you made in accordance with Part 4.6, including any necessary maintenance or corrective actions;

d. If you are inspecting your site at the frequency specified in Part 4.2.2, Part 4.3, or Part 4.4.1b, and you conducted an inspection because of rainfall measuring 0.25 inches or greater, you must include the applicable rain gauge or weather station readings that triggered the inspection; and

e. If you determined that it is unsafe to inspect a portion of your site, you must describe the reason you found it to be unsafe and specify the locations to which this condition applies.

4.7.2 Each inspection report must be signed in accordance with Appendix I, Part I.11 of this permit.

4.7.3 You must keep a copy of all inspection reports at the site or at an easily accessible location, so that it can be made available at the time of an on-site inspection or upon request by EPA.

4.7.4 You must retain all inspection reports completed for this Part for at least three (3) years from the date that your permit coverage expires or is terminated.

4.8 INSPECTIONS BY EPA

You must allow EPA, or an authorized representative of EPA, to conduct the following activities at reasonable times. To the extent that you are utilizing shared controls that are

not on site to comply with this permit, you must make arrangements for EPA to have access at all reasonable times to those areas where the shared controls are located.

4.8.1 Enter onto all areas of the site, including any construction support activity areas covered by this permit, any off-site areas where shared controls are utilized to comply with this permit, discharge locations, adjoining waterbodies, and locations where records are kept under the conditions of this permit;

4.8.2 Access and copy any records that must be kept under the conditions of this permit;

4.8.3 Inspect your construction site, including any construction support activity areas covered by this permit (see Part 1.2.1c), any stormwater controls installed and maintained at the site, and any off-site shared controls utilized to comply with this permit; and

4.8.4 Sample or monitor for the purpose of ensuring compliance.

5 CORRECTIVE ACTIONS

5.1 CONDITIONS TRIGGERING CORRECTIVE ACTION.

You must take corrective action to address any of the following conditions identified at your site:

5.1.1 A stormwater control needs repair or replacement (beyond routine maintenance required under Part 2.1.4); or

5.1.2 A stormwater control necessary to comply with the requirements of this permit was never installed, or was installed incorrectly; or

5.1.3 Your discharges are causing an exceedance of applicable water quality standards; or

5.1.4 A prohibited discharge has occurred (see Part 1.3).

5.2 CORRECTIVE ACTION DEADLINES

For any corrective action triggering conditions in Part 5.1, you must**:**

5.2.1 Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events;

5.2.2 When the problem does not require a new or replacement control or significant repair, the corrective action must be completed by the close of the next business day;

5.2.3 When the problem requires a new or replacement control or significant repair, install the new or modified control and make it operational, or complete the repair, by no later than seven (7) calendar days from the time of discovery. If it is infeasible to complete the installation or repair within seven (7) calendar days, you must document in your records why it is infeasible to complete the installation or repair within the 7-day timeframe and document your schedule for installing the stormwater control(s) and making it operational as soon as feasible after the 7-day timeframe. Where these actions result in changes to any of the stormwater controls or procedures documented in your SWPPP, you must modify your SWPPP accordingly within seven (7) calendar days of completing this work.

5.3 CORRECTIVE ACTION REQUIRED BY EPA

You must comply with any corrective actions required by EPA as a result of permit violations found during an inspection carried out under Part 4.8.

5.4 CORRECTIVE ACTION REPORT

For each corrective action taken in accordance with this Part, you must complete a report in accordance with the following:

5.4.1 Within 24 hours of identifying the corrective action condition, document the specific condition and the date and time it was identified.

5.4.2 Within 24 hours of completing the corrective action (in accordance with the deadlines in Part 5.2), document the actions taken to address the condition, including whether any SWPPP modifications are required.

5.4.3 Each corrective action report must be signed in accordance with Appendix I, Part I.11 of this permit.

5.4.4 You must keep a copy of all corrective action reports at the site or at an easily accessible location, so that it can be made available at the time of an on-site inspection or upon request by EPA.

5.4.5 You must retain all corrective action reports completed for this Part for at least three (3) years from the date that your permit coverage expires or is terminated.

6 STAFF TRAINING REQUIREMENTS

Each operator, or group of multiple operators, must assemble a "stormwater team" to carry out compliance activities associated with the requirements in this permit.

6.1 Prior to the commencement of construction activities, you must ensure that the following personnel[51] on the stormwater team understand the requirements of this permit and their specific responsibilities with respect to those requirements:

a. Personnel who are responsible for the design, installation, maintenance, and/or repair of stormwater controls (including pollution prevention controls);
b. Personnel responsible for the application and storage of treatment chemicals (if applicable);
c. Personnel who are responsible for conducting inspections as required in Part 4.1; and
d. Personnel who are responsible for taking corrective actions as required in Part 5.

6.2 You are responsible for ensuring that all activities on the site comply with the requirements of this permit. You are not required to provide or document formal training for subcontractors or other outside service providers, but you must ensure that such personnel understand any requirements of this permit that may be affected by the work they are subcontracted to perform.

[51] If the person requiring training is a new employee who starts after you commence construction activities, you must ensure that this person has the proper understanding as required above prior to assuming particular responsibilities related to compliance with this permit.

For emergency-related projects, the requirement to train personnel prior to commencement of construction activities does not apply, however, such personnel must have the required training prior to NOI submission.

6.3 At a minimum, members of the stormwater team must be trained to understand the following if related to the scope of their job duties *(e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections*):

a. The permit deadlines associated with installation, maintenance, and removal of stormwater controls and with stabilization;
b. The location of all stormwater controls on the site required by this permit and how they are to be maintained;
c. The proper procedures to follow with respect to the permit's pollution prevention requirements; and
d. When and how to conduct inspections, record applicable findings, and take corrective actions.

6.4 Each member of the stormwater team must have easy access to an electronic or paper copy of applicable portions of this permit, the most updated copy of your SWPPP, and other relevant documents or information that must be kept with the SWPPP.

7 STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

7.1 GENERAL REQUIREMENTS

All operators associated with a construction site under this permit must develop a SWPPP consistent with the requirements in Part 7 prior to their submittal of the NOI.[52, 53] The SWPPP must be kept up-to-date throughout coverage under this permit.

If a SWPPP was prepared under a previous version of this permit, the operator must review and update the SWPPP to ensure that this permit's requirements are addressed prior to submitting an NOI for coverage under this permit.

7.2 SWPPP CONTENTS

At a minimum, the SWPPP must include the information specified in this Part and as specified in other parts of this permit.

7.2.1 All Site Operators. Include a list of all other operators who will be engaged in construction activities at the site, and the areas of the site over which each operator has control.

7.2.2 Stormwater Team. Identify the personnel (by name or position) that are part of the stormwater team, as well as their individual responsibilities, including which members are responsible for conducting inspections.

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[52] The SWPPP does not establish the effluent limits and other permit terms and conditions that apply to your site's discharges; these limits, terms, and conditions are established in this permit.

Where there are multiple operators associated with the same site, they may develop a group SWPPP instead of multiple individual SWPPPs. Regardless of whether there is a group SWPPP or multiple individual SWPPPs, each operator is responsible for compliance with the permit's terms and conditions. In other words, if Operator A relies on Operator B to satisfy its permit obligations, Operator A does not have to duplicate those permit-related functions if Operator B is implementing them for both operators to be in compliance with the permit. However, Operator A remains responsible for permit compliance if Operator B fails to implement any measures necessary for Operator A to comply with the permit. In addition, all operators must ensure, either directly or through coordination with other operators, that their activities do not compromise any other operators' controls and/or any shared controls.

7.2.3 Nature of Construction Activities.[54] Include the following:

a. A description of the nature of your construction activities, including the age or dates of past renovations for structures that are undergoing demolition;

b. The size of the property (in acres or length in miles if a linear construction site);

c. The total area expected to be disturbed by the construction activities (to the nearest quarter acre or nearest quarter mile if a linear construction site);

d. A description of any on-site and off-site construction support activity areas covered by this permit (see Part 1.2.1c);

e. The maximum area expected to be disturbed at any one time, including on-site and off-site construction support activity areas;

f. A description and projected schedule for the following:

   i. Commencement of construction activities in each portion of the site, including clearing and grubbing, mass grading, demolition activities, site preparation (*i.e., excavating, cutting and filling*), final grading, and creation of soil and vegetation stockpiles requiring stabilization;

   ii. Temporary or permanent cessation of construction activities in each portion of the site;

   iii. Temporary or final stabilization of exposed areas for each portion of the site; and

   iv. Removal of temporary stormwater controls and construction equipment or vehicles, and the cessation of construction-related pollutant-generating activities.

g. A list and description of all pollutant-generating activities[55] on the site. For each pollutant-generating activity, include an inventory of pollutants or pollutant constituents (*e.g., sediment, fertilizers, pesticides, paints, caulks, sealants, fluorescent light ballasts, contaminated substrates, solvents, fuels*) associated with that activity, which could be discharged in stormwater from your construction site. You must take into account where potential spills and leaks could occur that contribute pollutants to stormwater discharges, and any known hazardous or toxic substances, such as PCBs and asbestos, that will be disturbed or removed during construction;

h. Business days and hours for the project;

i. If you are conducting construction activities in response to a public emergency (see Part 1.4), a description of the cause of the public emergency *(e.g., mud slides, earthquake, extreme flooding conditions, widespread disruption in essential public services)*, information substantiating its occurrence *(e.g., state disaster declaration or similar state or local declaration)*, and a description of the construction necessary to reestablish affected public services.

7.2.4 Site Map. Include a legible map, or series of maps, showing the following features of the site:

a. Boundaries of the property;

[54] If plans change due to unforeseen circumstances or for other reasons, the requirement to describe the sequence and estimated dates of construction activities is not meant to "lock in" the operator to meeting these dates. When departures from initial projections are necessary, this should be documented in the SWPPP itself, or in associated records, as appropriate.

[55] Examples of pollutant-generating activities include paving operations; concrete, paint, and stucco washout and waste disposal; solid waste storage and disposal; and dewatering operations.

b. Locations where construction activities will occur, including:
   i. Locations where earth-disturbing activities will occur (note any phasing), including any demolition activities;
   ii. Approximate slopes before and after major grading activities (note any steep slopes (as defined in Appendix A));
   iii. Locations where sediment, soil, or other construction materials will be stockpiled;
   iv. Any water of the U.S. crossings;
   v. Designated points where vehicles will exit onto paved roads;
   vi. Locations of structures and other impervious surfaces upon completion of construction; and
   vii. Locations of on-site and off-site construction support activity areas covered by this permit (see Part 1.2.1c).
c. Locations of all waters of the U.S. within and one mile downstream of the site's discharge point. Also identify if any are listed as impaired, or are identified as a Tier 2, Tier 2.5, or Tier 3 water;
d. Areas of federally listed critical habitat within the site and/or at discharge locations;
e. Type and extent of pre-construction cover on the site (*e.g., vegetative cover, forest, pasture, pavement, structure*s);
f. Drainage patterns of stormwater and authorized non-stormwater before and after major grading activities;
g. Stormwater and authorized non-stormwater discharge locations, including:
   i. Locations where stormwater and/or authorized non-stormwater will be discharged to storm drain inlets;[56] and
   ii. Locations where stormwater or authorized non-stormwater will be discharged directly to waters of the U.S.
h. Locations of all potential pollutant-generating activities identified in Part 7.2.3g;
i. Locations of stormwater controls, including natural buffer areas and any shared controls utilized to comply with this permit; and
j. Locations where polymers, flocculants, or other treatment chemicals will be used and stored.

7.2.5 Non-Stormwater Discharges. Identify all authorized non-stormwater discharges in Part 1.2.2 that will or may occur.

7.2.6 Description of Stormwater Controls.

a. For each of the Part 2.2 erosion and sediment control effluent limits, Part 2.3 pollution prevention effluent limits, and Part 2.4 construction dewatering effluent limits, as applicable to your site, you must include the following:
   i. A description of the specific control(s) to be implemented to meet the effluent limit;

[56] The requirement to show storm drain inlets in the immediate vicinity of the site on your site map only applies to those inlets that are easily identifiable from your site or from a publicly accessible area immediately adjacent to your site.

ii. Any applicable stormwater control design specifications (including references to any manufacturer specifications and/or erosion and sediment control manuals/ordinances relied upon);[57]

iii. Routine stormwater control maintenance specifications; and

iv. The projected schedule for stormwater control installation/implementation.

b. You must also include any of the following additional information as applicable.

i. **Natural buffers and/or equivalent sediment controls** (see Part 2.2.1 and Appendix G). You must include the following:

(a) The compliance alternative to be implemented;

(b) If complying with alternative 2, the width of natural buffer retained;

(c) If complying with alternative 2 or 3, the erosion and sediment control(s) you will use to achieve an equivalent sediment reduction, and any information you relied upon to demonstrate the equivalency;

(d) If complying with alternative 3, a description of why it is infeasible for you to provide and maintain an undisturbed natural buffer of any size;

(e) For "linear construction sites" where it is infeasible to implement compliance alternative 1, 2, or 3, a rationale for this determination, and a description of any buffer width retained and/or supplemental erosion and sediment controls installed; and

(f) A description of any disturbances that are exempt under Part 2.2.1 that occur within 50 feet of a water of the U.S.

ii. **Perimeter controls for a "linear construction site"** (see Part 2.2.3). For areas where perimeter controls are not feasible, include documentation to support this determination and a description of the other practices that will be implemented to minimize discharges of pollutants in stormwater associated with construction activities.

Note: Routine maintenance specifications for perimeter controls documented in the SWPPP must include the Part 2.2.3a requirement that sediment be removed before it has accumulated to one-half of the above-ground height of any perimeter control.

iii. **Sediment track-out controls** (see Parts 2.2.4b and 2.2.4c). Document the specific stabilization techniques and/or controls that will be implemented to remove sediment prior to vehicle exit.

iv. **Sediment basins** (see Part 2.2.12). In circumstances where it is infeasible to utilize outlet structures that withdraw water from the surface, include documentation to support this determination, including the specific conditions or time periods when this exception will apply.

v. **Treatment chemicals** (see Part 2.2.13), you must include the following:

(a) A listing of the soil types that are expected to be exposed during construction in areas of the project that will drain to chemical treatment systems. Also include a listing of soil types expected to be found in fill material to be used in these same areas, to the extent you have this information prior to construction;

[57] Design specifications may be found in manufacturer specifications and/or in applicable erosion and sediment control manuals or ordinances. Any departures from such specifications must reflect good engineering practice and must be explained in the SWPPP.

(b) A listing of all treatment chemicals to be used at the site and why the selection of these chemicals is suited to the soil characteristics of your site;

(c) If the applicable EPA Regional Office authorized you to use cationic treatment chemicals for sediment control, include the specific controls and implementation procedures designed to ensure that your use of cationic treatment chemicals will not lead to an exceedance of water quality standards;

(d) The dosage of all treatment chemicals to be used at the site or the methodology to be used to determine dosage;

(e) Information from any applicable Safety Data Sheet (SDS);

(f) Schematic drawings of any chemically enhanced stormwater controls or chemical treatment systems to be used for application of the treatment chemicals;

(g) A description of how chemicals will be stored consistent with Part 2.2.13c;

(h) References to applicable state or local requirements affecting the use of treatment chemicals, and copies of applicable manufacturer's specifications regarding the use of your specific treatment chemicals and/or chemical treatment systems; and

(i) A description of the training that personnel who handle and apply chemicals have received prior to permit coverage, or will receive prior to use of the treatment chemicals at your site.

vi. **Stabilization measures** (see Part 2.2.14). You must include the following:

(a) The specific vegetative and/or non-vegetative practices that will be used;

(b) The stabilization deadline that will be met in accordance with Part 2.2.14.a.i-ii;

(c) If complying with the deadlines for sites in arid, semi-arid, or drought-stricken areas, the beginning and ending dates of the seasonally dry period and the schedule you will follow for initiating and completing vegetative stabilization; and

(d) If complying with deadlines for sites affected by unforeseen circumstances that delay the initiation and/or completion of vegetative stabilization, document the circumstances and the schedule for initiating and completing stabilization.

vii. **Spill prevention and response procedures** (see Part 1.3.5 and Part 2.3). You must include the following:

(a) Procedures for expeditiously stopping, containing, and cleaning up spills, leaks, and other releases. Identify the name or position of the employee(s) responsible for detection and response of spills or leaks; and

(b) Procedures for notification of appropriate facility personnel, emergency response agencies, and regulatory agencies where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity consistent with Part 2.3.6 and established under either 40 CFR 110, 40 CFR 117, or 40 CFR 302, occurs during a 24-hour period. Contact information must be in locations that are readily accessible and available to all employees.

You may also reference the existence of Spill Prevention Control and

Countermeasure (SPCC) plans developed for the construction activity under Part 311 of the CWA, or spill control programs otherwise required by an NPDES permit for the construction activity, provided that you keep a copy of that other plan on site.[58]

viii. **Waste management procedures** (see Part 2.3.3). Describe the procedures you will follow for handling, storing and disposing of all wastes generated at your site consistent with all applicable federal, state, tribal, and local requirements, including clearing and demolition debris, sediment removed from the site, construction and domestic waste, hazardous or toxic waste, and sanitary waste.

ix. **Application of fertilizers** (see Part 2.3.5). Document any departures from the manufacturer specifications where appropriate.

7.2.7 Procedures for Inspection, Maintenance, and Corrective Action. Describe the procedures you will follow for maintaining your stormwater controls, conducting site inspections, and, where necessary, taking corrective actions, in accordance with Part 2.1.4, Part 4, and Part 5 of this permit. Also include:

a. The inspection schedule you will follow, which is based on whether your site is subject to Part 4.2 or Part 4.3, or whether your site qualifies for any of the reduced inspection frequencies in Part 4.4;

b. If you will be conducting inspections in accordance with the inspection schedule in Part 4.2.2, Part 4.3, or Part 4.4.1b, the location of the rain gauge or the address of the weather station you will be using to obtain rainfall data;

c. If you will be reducing your inspection frequency in accordance with Part 4.4.1b, the beginning and ending dates of the seasonally defined arid period for your area or the valid period of drought;

d. If you will be reducing your inspection frequency in accordance with Part 4.4.3, the beginning and ending dates of frozen conditions on your site; and

e. Any maintenance or inspection checklists or other forms that will be used.

7.2.8 Staff Training. Include documentation that the required personnel were, or will be, trained in accordance with Part 6.

7.2.9 Compliance with Other Requirements.

a. **Threatened and Endangered Species Protection.** Include documentation required in Appendix D supporting your eligibility with regard to the protection of threatened and endangered species and designated critical habitat.

b. **Historic Properties.** Include documentation required in Appendix E supporting your eligibility with regard to the protection of historic properties.

c. **Safe Drinking Water Act Underground Injection Control (UIC) Requirements for Certain Subsurface Stormwater Controls.** If you are using any of the following stormwater controls at your site, document any contact you have had with the applicable state agency[59] or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing

[58] Even if you already have an SPCC or other spill prevention plan in existence, your plans will only be considered adequate if they meet all of the requirements of this Part, either as part of your existing plan or supplemented as part of the SWPPP.

[59] For state UIC program contacts, refer to the following EPA website: https://www.epa.gov/uic.

regulations at 40 CFR 144 -147. Such controls would generally be considered Class V UIC wells:

i. Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system);

ii. Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow; and

iii. Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system).

7.2.10 SWPPP Certification. You must sign and date your SWPPP in accordance with Appendix I, Part I.11.

7.2.11 Post-Authorization Additions to the SWPPP. Once you are authorized for coverage under this permit, you must include the following documents as part of your SWPPP:

a. A copy of your NOI submitted to EPA along with any correspondence exchanged between you and EPA related to coverage under this permit;

b. A copy of the acknowledgment letter you receive from NeT assigning your NPDES ID (*i.e., permit tracking number*);

c. A copy of this permit (an electronic copy easily available to the stormwater team is also acceptable).

7.3 ON-SITE AVAILABILITY OF YOUR SWPPP

You must keep a current copy of your SWPPP at the site or at an easily accessible location so that it can be made available at the time of an on-site inspection or upon request by EPA; a state, tribal, or local agency approving stormwater management plans; the operator of a storm sewer system receiving discharges from the site; or representatives of the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS).

EPA may provide access to portions of your SWPPP to a member of the public upon request. Confidential Business Information (CBI) will be withheld from the public, but may not be withheld from EPA, USFWS, or NMFS.[60]

If an on-site location is unavailable to keep the SWPPP when no personnel are present, notice of the plan's location must be posted near the main entrance of your construction site.

7.4 SWPPP MODIFICATIONS

[60] Information covered by a claim of confidentiality will be disclosed by EPA only to the extent of, and by means of, the procedures set forth in 40 CFR Part 2, Subpart B. In general, submitted information protected by a business confidentiality claim may be disclosed to other employees, officers, or authorized representatives of the United States concerned with implementing the CWA. The authorized representatives, including employees of other executive branch agencies, may review CBI during the course of reviewing draft regulations.

7.4.1 You must modify your SWPPP, including the site map(s), within seven (7) days of any of the following conditions:

a. Whenever new operators become active in construction activities on your site, or you make changes to your construction plans, stormwater controls, or other activities at your site that are no longer accurately reflected in your SWPPP. This includes changes made in response to corrective actions triggered under Part 5. You do not need to modify your SWPPP if the estimated dates in Part 7.2.3f change during the course of construction;

b. To reflect areas on your site map where operational control has been transferred (and the date of transfer) since initiating permit coverage;

c. If inspections or investigations by EPA or its authorized representatives determine that SWPPP modifications are necessary for compliance with this permit;

d. Where EPA determines it is necessary to install and/or implement additional controls at your site in order to meet the requirements of this permit, the following must be included in your SWPPP:

   i. A copy of any correspondence describing such measures and requirements; and

   ii. A description of the controls that will be used to meet such requirements.

e. To reflect any revisions to applicable federal, state, tribal, or local requirements that affect the stormwater controls implemented at the site; and

f. If applicable, if a change in chemical treatment systems or chemically enhanced stormwater control is made, including use of a different treatment chemical, different dosage rate, or different area of application.

7.4.2 You must maintain records showing the dates of all SWPPP modifications. The records must include the name of the person authorizing each change (see Part 7.2.10 above) and a brief summary of all changes.

7.4.3 All modifications made to the SWPPP consistent with Part 7.4 must be authorized by a person identified in Appendix I, Part I.11.b.

7.4.4 Upon determining that a modification to your SWPPP is required, if there are multiple operators covered under this permit, you must immediately notify any operators who may be impacted by the change to the SWPPP.

8 HOW TO TERMINATE COVERAGE

Until you terminate coverage under this permit, you must comply with all conditions and effluent limitations in the permit. To terminate permit coverage, you must submit to EPA a complete and accurate Notice of Termination (NOT), which certifies that you have met the requirements for terminating in Part 8.

8.1 MINIMUM INFORMATION REQUIRED IN NOT

8.1.1 NPDES ID (*i.e., permit tracking number)* provided by EPA when you received coverage under this permit;

8.1.2 Basis for submission of the NOT (see Part 8.2);

8.1.3 Operator contact information;

8.1.4 Name of site and address (or a description of location if no street address is available); and

8.1.5 NOT certification.

8.2 CONDITIONS FOR TERMINATING CGP COVERAGE

You must terminate CGP coverage only if one or more of the following conditions has occurred:

8.2.1 You have completed all construction activities at your site and, if applicable, construction support activities covered by this permit (see Part 1.2.1c), and you have met the following requirements:

a. For any areas that (1) were disturbed during construction, (2) are not covered over by permanent structures, and (3) over which you had control during the construction activities, you have met the requirements for final vegetative or non-vegetative stabilization in Part 2.2.14b;

b. You have removed and properly disposed of all construction materials, waste and waste handling devices, and have removed all equipment and vehicles that were used during construction, unless intended for long-term use following your termination of permit coverage;

c. You have removed all stormwater controls that were installed and maintained during construction, except those that are intended for long-term use following your termination of permit coverage or those that are biodegradable; and

d. You have removed all potential pollutants and pollutant-generating activities associated with construction, unless needed for long-term use following your termination of permit coverage; or

8.2.2 You have transferred control of all areas of the site for which you are responsible under this permit to another operator, and that operator has submitted an NOI and obtained coverage under this permit; or

8.2.3 Coverage under an individual or alternative general NPDES permit has been obtained.

8.3 HOW TO SUBMIT YOUR NOT

You must use EPA's NPDES eReporting Tool (NeT) to electronically prepare and submit your NOT for the 2017 CGP.

To access NeT, go to https://www.epa.gov/npdes/stormwater-discharges-construction-activities#ereporting.

Waivers from electronic reporting may be granted as specified in Part 1.4.1. If the EPA Regional Office grants you approval to use a paper NOT, and you elect to use it, you must complete the form in Appendix K.

8.4 DEADLINE FOR SUBMITTING THE NOT

You must submit your NOT within 30 calendar days after any one of the conditions in Part 8.2 occurs.

8.5 EFFECTIVE DATE OF TERMINATION OF COVERAGE

Your authorization to discharge under this permit terminates at midnight of the calendar day that a complete NOT is submitted to EPA.

9 PERMIT CONDITIONS APPLICABLE TO SPECIFIC STATES, INDIAN COUNTRY LANDS, OR TERRITORIES

The provisions in this Part provide modifications or additions to the applicable conditions of this permit to reflect specific additional conditions required as part of the state or tribal CWA Section 401 certification process, or the Coastal Zone Management Act (CZMA) certification process, or as otherwise established by the permitting authority. The specific additional revisions and requirements only apply to activities in those specific states, Indian country, and areas in certain states subject to construction projects by Federal Operators. States, Indian country, and areas subject to construction by Federal Operators not included in this Part do not have any modifications or additions to the applicable conditions of this permit.

9.1 EPA Region 1

9.1.1 NHR100000 State of New Hampshire

a. If you disturb 100,000 square feet or more of contiguous area, you must also apply for an Alteration of Terrain (AoT) permit from DES pursuant to RSA 485- A:17 and Env-Wq 1500. This requirement also applies to a lower disturbance threshold of 50,000 square feet or more when construction occurs within the protected shoreline under the Shoreland Water Quality Protection Act (see RSA 483-B and Env-Wq 1400). A permit application must also be filed if your project disturbs an area of greater than 2,500 square feet, is within 50 feet of any surface water, and has a flow path of 50 feet or longer disturbing a grade of 25 percent or greater. Project sites with disturbances smaller than those discussed above, that have the potential to adversely affect state surface waters, are subject to the conditions of an AoT General Permit by Rule.

b. You must determine that any excavation dewatering discharges are not contaminated before they will be authorized as an allowable non-stormwater discharge under this permit (see Part 1.2.2). The water is considered uncontaminated if there is no groundwater contamination within 1,000 feet of the groundwater dewatering location. Information on groundwater contamination can be generated over the Internet via the NHDES web site http://des.nh.gov/ by using the One Stop Data Mapper at http://des.nh.gov/onestop/gis.htm. If it is determined that the groundwater to be dewatered is near a remediation or other waste site you must apply for the Remediation General Permit (see https://www3.epa.gov/region1/npdes/rgp.html.)

c. You must treat any uncontaminated excavation dewatering discharges as necessary to remove suspended solids and turbidity. The discharges must be sampled at least once per week during weeks when discharges occur. Samples must be analyzed for total suspended solids (TSS) or turbidity and must meet monthly average and daily maximum limits of 50 milligrams per liter (mg/L) and 100 mg/L, respectively for TSS or 33 mg/l and 67 mg/l, respectively for turbidity. TSS (a.k.a. Residue, Nonfilterable) or turbidity sampling and analysis must be performed in accordance with Tables IB and II in 40 CFR 136.3 (http://www.ecfr.gov/cgi-bin/text-idx?SID=0243e3c4283cbd7d8257eb6afc7ce9a2&mc=true&node=se40.25.136_13&rgn=div8). Records of any sampling and analysis must be maintained and kept with the SWPPP for at least three years after final site stabilization.

d. Construction site owners and operators must consider opportunities for post-construction groundwater recharge using infiltration best management practices

(BMPs) during site design and preparation of the SWPPP. If your construction site is in a town that is required to obtain coverage under the NPDES General Permit for discharges from Municipal Separate Storm Sewer Systems (MS4) you may be required to use such practices. The SWPPP must include a description of any on-site infiltration that will be installed as a post-construction stormwater management measure or reasons for not employing such measures such as 1) The facility is located in a wellhead protection area as defined in RSA 485- C:2; or 2) The facility is located in an area where groundwater has been reclassified to GAA, GAI or GA2 pursuant to RSA 485-C and Env-DW 901; or 3) Any areas that would be exempt from the groundwater recharge requirements contained in Env-Wq 1507.04, including all land uses or activities considered to be a "High-load Area" (see Env-Wq 1502.30). For design considerations for infiltration measures see Env-Wq 1508.06.

e. Appendix F contains a list of Tier 2, or high quality waters. Although there is no official list of tier 2 waters, it can be assumed that all NH surface waters are tier 2 for turbidity unless 1) the surface water that you are proposing to discharge into is listed as impaired for turbidity in the states listing of impaired waters (see Surface Water Quality - Watershed Report Cards at http://des.nh.gov/organization/divisions/water/wmb/swqa/report_cards.htm) or 2) sampling upstream of the proposed discharge location shows turbidity values greater than 10 NTU. A single grab sample collected during dry weather (no precipitation within 48 hours) is acceptable.

f. To ensure compliance with RSA 485-C, RSA 485-A, RSA 485-A:13, I(a), Env-Wq 1700 and Env-Wq 302, the following information may be requested by NHDES. This information must be kept on site unless you receive a written request from NHDES that it be sent to the address shown in Part 9.1.4 (g).

    i. A site map required in Part 7.2.4, showing the type and location of all post-construction infiltration BMPs utilized at the facility or the reason(s) why none were installed;

    ii. A list of all non-stormwater discharges that occur at the facility, including their source locations and the control measures being used (see Part 1.2.2).

    iii. Records of sampling and analysis of TSS required for construction dewatering discharges (see Part 9.1.4 (c)).

g. All required or requested documents must be sent to:

    NH Department of Environmental Services, Wastewater Engineering Bureau,
    Permits & Compliance Section
    P.O. Box 95
    Concord, NH 03302-0095

9.1.2 VTR10F000 Areas in the State of Vermont subject to construction by a Federal Operator

a. Earth disturbance at any one time is limited to five acres.

b. All areas of earth disturbance must have temporary or final stabilization within 14 days of the initial disturbance. After this time, disturbed areas must be temporarily or permanently stabilized in advance of any runoff producing event. A runoff producing event is an event that produces runoff from the construction site. Temporary stabilization is not required if the work is occurring in a self-contained

excavation (i.e. no outlet) with a depth of two feet or greater (e.g. house foundation excavation, utility trenches). Areas of a construction site that drain to sediment basins are not considered eligible for this exemption, and the exemption applies only to the excavated area itself.

c. The use of the cationic polymers is prohibited unless approved under a site-specific plan.

d. Site inspections on active construction sites shall be conducted daily during the period from October 15 – April 15.

e. Any applicant under EPA's CGP shall allow authorized Agency representatives, at reasonable times and upon presentation of credentials, to enter upon the project site for purposes of inspecting the project and determining compliance with this Certification.

f. The Agency may reopen and alter or amend the conditions of this Certification over the life of the project when such action is necessary to assure compliance with the VWQS.

9.2 EPA Region 3

9.2.1 DCR100000 District of Columbia

a. The permittee must comply with the District of Columbia Water Pollution Control Act of 1984, as amended, (D.C. Official Code § 8-103.01 et seq.) and its implementing regulations in Title 21, Chapters 11 and 19 of the District of Columbia Municipal Regulations. Nothing in this permit will be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to District of Columbia laws and regulations.

b. The permittee must comply with the District of Columbia Stormwater Management, and Soil Erosion and Sediment Control in Chapter 5 of Title 21 of the District of Columbia Municipal Regulations.

c. The permittee must comply with District of Columbia Flood Management control in Chapter 31 of Title 20 of the District of Columbia Municipal Regulations.

d. The Department may request a copy of the Stormwater Pollution Prevention Plan (SWPPP) and the permittee is required to submit the SWPPP to the Department within 14 days of such request. The Department may conduct an inspection of any facility covered by this permit to ensure compliance with District's law requirements, including water quality standards. The Department may enforce its certification conditions.

e. The Department may require the permittee to perform water quality monitoring during the permit term if monitoring is necessary for the protection of public health or the environment as designated under the authority in Chapter 19 of Title 21 of the District of Columbia Municipal Regulations.

f. The Department may require the permittee to provide measurable verification of the effectiveness of Best Management Practices (BMPs) and other control measures used in the stormwater management program, including water quality monitoring.

g. The Department has determined that compliance with this permit does not protect the permittee from enforcement actions deemed necessary by the Department

under its associated regulations to address an imminent threat to public health or a significant adverse environmental impact which results in a violation of the District of Columbia Water Pollution Control Act of 1984, as amended, (D.C. Official Code § 8-103.01 et seq.) and its implementing regulations.

h. The Department reserves the right to modify this Section 401 Water Quality Certification if any changes, modifications, or deletions are made to this general permit. In addition, the Department reserves the right to add and/or alter the terms and conditions of this Section 401 Water Quality Certification to carry out its responsibilities during the term of this general permit with respect to water quality, including any revisions to District of Columbia Water Quality Standards in Chapter 11 of Title 21 of the District of Columbia Municipal Regulations.

i. Should any violation of the District's Water Quality Standards, or the conditions of this Section 401 Water Quality Certification occur, the Department will direct the permittee to correct the violation(s). The Department has the right to take any action as authorized by the District laws and regulations to address the violations of this permit or the Water Pollution Control Act and implementing regulations. Substantial civil and criminal penalties are authorized for discharging into District waters in violation of an order or permit issued by the Department. This Section 401 Water Quality Certification does not relieve the permittee of the duty to comply with other applicable District's statutes and regulations.

j. The permittee must submit copies of Notice of Intent (NOI) and Notice of Termination to DOEE at the same time these documents are submitted to EPA.

k. The permittee shall allow DOEE to inspect any facilities, equipment, practices, or operations regulated or required under this permit and to access records maintained under the conditions of this permit.

l. All required or requested documents shall be signed and sent to the: Department of Energy & Environment, 1200 First Street, N.E., 5th Floor, Washington, DC 20002, Attention: Associate Director, Inspection and Enforcement Division.

9.2.2 DER10F000 Areas in the State of Delaware subject to construction by a Federal Operator

a. Federal agencies engaging in construction activities must submit, to DNREC, a sediment and stormwater management (S&S) plan and obtain approval from DNREC in accordance with 7 Del. C. §4010, 7 DE Admin. Code 5101, and 7 DE Admin. Code 7201.

b. Federal agencies engaging in construction activities must provide for construction review by a certified construction reviewer in accordance with 7 Del. C. §§4010 & 4013 and 7 DE Admin. Code 5101, subsection 6.1.6.

c. Federal agencies engaging in construction activities must certify that all responsible personnel involved in the construction project will have attended the blue card training prior to initiation of any land disturbing activity – *see* 7 Del. C. §§ 4002 & 4014 and 7 DE Admin. Code 5101.

9.3 EPA Region 5

9.3.1 MNR10I000 Indian country within the State of Minnesota

9.3.1.1 Fond du Lac Band of Lake Superior Chippewa. The following conditions apply only to discharges on the Fond du Lac Band of Lake Superior Chippewa Reservation:

a. A copy of the Stormwater Pollution Prevention Plan (SWPPP) must be submitted to the Office of Water Protection at least fifteen (15) days in advance of sending the Notice of Intent (NOI) to EPA. The SWPPP can be submitted electronically to richardgitar@FDLREZ.com or by hardcopy sent to:

Fond du Lac Reservation
Office of Water Protection
1720 Big Lake Road
Cloquet, MN 55720

CGP applicants are encouraged to work with the FDL Office of Water Protection in the identification of all proposed receiving.

b. Copies of the Notice of Intent (NOI) and the Notice of Termination (NOT) must be sent to the Fond du Lac Office of Water Protection at the same time they are submitted to EPA.

c. The turbidity limit shall NOT exceed 10% of natural background within the receiving water(s) as determined by Office of Water Protection staff.

d. Turbidity sampling must take place within 24 hours of a ½-inch or greater rainfall event. The results of the sampling must be reported to the Office of Water Protection within 7 days of the sample collection. All sample reporting must include the date and time, location (GPS: UTM/Zone 15), and NTU. CGP applicants are encouraged to work with the Office of Water Protection in determining the most appropriate location(s) for sampling.

e. Receiving waters with open water must be sampled for turbidity prior to any authorized discharge as determined by Office of Water Protection staff. This requirement only applies to receiving waters in which no ambient turbidity data exists.

f. This Certification does not pertain to any new discharge to Outstanding Reservation Resource Waters (ORRW) as described in §105 b.3. of the Fond du Lac Water Quality Standards (Ordinance #12/98, as amended). Although additional waters may be designated in the future, currently Perch Lake, Rice Portage Lake, Miller Lake, Deadfish Lake, and Jaskari Lake are designated as ORRWs. New dischargers wishing to discharge to an ORRW must obtain an individual permit from EPA for stormwater discharges from large and small construction activities.

g. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in the Water Quality Standards of the Fond du Lac Reservation, Ordinance 12/98, as amended. This includes, but is not limited to, the prevention of any discharge that causes a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of water of the Fond du Lac Reservation for any of the uses designated in the Water Quality Standards of the Fond du Lac Reservation. These uses include wildlife, aquatic life, warm water fisheries, cold water fisheries, subsistence fishing (netting), primary contact recreation, secondary

contact recreation, cultural, wild rice areas, aesthetic waters, agriculture, navigation, and commercial.

h. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the Fond du Lac Reservation. All spills must be reported to the appropriate emergency management agency (National Response Center AND the State Duty Officer), and measures shall be taken immediately to prevent the pollution of waters of the Fond du Lac Reservation, including groundwater. The Fond du Lac Office of Water Protection must also be notified immediately of any spill regardless of size.

i. This certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for such listing.

9.3.1.2 Grand Portage Band of Lake Superior Chippewa. The following conditions apply only to discharges on the Grand Portage Band of Lake Superior Chippewa Reservation:

a. The CGP authorization is for construction activities that may occur within the exterior boundaries of the Grand Portage Reservation in accordance to the Grand Portage Land Use Ordinance. The CGP regulates stormwater discharges associated with construction sites of one acre or more in size. Only those activities specifically authorized by the CGP are authorized by this certification (the "Certification"). This Certification does not authorize impacts to cultural, historical, or archeological features or sites, or properties that may be eligible for listing as such.

b. All construction stormwater discharges authorized by the CGP must comply with the Water Quality Standards and Water Resources Ordinance, as well as Applicable Federal Standards (as defined in the Water Resources Ordinance). As such, appropriate steps must be taken to ensure that petroleum products or other chemical pollutants are prevented from entering the Waters of the Reservation (as defined in the Water Resources Ordinance). All spills must be reported to the appropriate emergency-management agency, and measures must be taken to prevent the pollution of the Waters of the Reservation, including groundwater.

c. The 2017 CGP requires inspections and monitoring reports of the construction site stormwater discharges by a qualified person. Monitoring and inspection reports must comply with the minimum requirements contained in the 2017 CGP. The monitoring plan must be prepared and incorporated into the Stormwater Pollution Prevention Plan (the "SWPPP"). A copy of the SWPPP must be submitted to the Board at least 30 days in advance of sending the requisite Notice of Intent to EPA. The SWPPP should be sent to:

Grand Portage Environmental Resources Board
P.O. Box 428
Grand Portage, MN 55605

Copies of the Notice of Intent and Notice of Termination required under the CGP must be submitted to the Board at the address above at the same time they are submitted to the EPA.

d. If requested by the Grand Portage Environmental Department, the permittee must provide additional information necessary for a case-by-case eligibility determination to assure compliance with the Water Quality Standards and any Applicable Federal Standards.

e. Discharges that the Board has determined to be or that may reasonably be expected to be contributing to a violation of Water Quality Standards or Applicable Federal Standards are not authorized by this Certification.

f. The Board retains full authority provided by the Water Resources Ordinance to ensure compliance with and to enforce the provisions of the Water Resource Ordinance and Water Quality Standards, Applicable Federal Standards, and these Certification conditions.

g. Appeals related to Board actions taken in accordance with any of the preceding conditions may be heard by the Grand Portage Tribal Court.

9.3.2 WIR10I000 Indian country within the State of Wisconsin, except the Sokaogon Chippewa (Mole Lake) Community

9.3.2.1 Bad River Band of Lake Superior Tribe of Chippewa Indians: The following conditions apply only to discharges on the Bad River Band of the Lake Superior Tribe of Chippewa Indians Reservation:

a. Only those activities specifically authorized by the CGP are authorized by this Certification. This Certification does not authorize impacts to cultural properties, or historical sites, or properties that may be eligible for listing as such.[61, 62]

b. All projects which are eligible for coverage under the CGP and are located within the exterior boundaries of the Bad River Reservation shall be implemented in such a manner that is consistent with the Tribe's Water Quality Standards (WQS) in order to protect Reservations waters that may be impacted by stormwater discharge including embankments, outlets, adjacent streambanks, slopes, and downstream waters.[63]

c. Operators are not eligible to obtain authorization under the CGP for all new discharges to an Outstanding Tribal Resource Water (or Tier 3 water).[64] Outstanding Tribal Resource Waters, or Tier 3 waters, include the following: Kakagon Slough and the lower wetland reaches of its tributaries that support wild rice, Kakagon River, Bad River Slough, Honest John Lake, Bog Lake, a portion of Bad River, from where it enters the Reservation through the confluence with the White River, and Potato River.[65]

d. An operator proposing to discharge to an Outstanding Resource Water (or Tier 2.5 water) under the CGP must comply with the antidegradation provisions of the Tribe's WQS. Outstanding Resource Waters, or Tier 2.5 waters, include the following: a portion of Bad River, from downstream the confluence with the White River to Lake Superior, White River, Marengo River, Graveyard Creek, Bear Trap Creek, Wood Creek, Brunsweiler River, Tyler Forks, Bell Creek, and Vaughn Creek.[66] The antidegradation demonstration materials described in provision E.4.iii. must be submitted to the following address:

[61] Bad River Band of Lake Superior Tribe of Chippewa Indians Water Quality Standards adopted by Resolution No. 7-6-11-441 (hereafter, Tribe's WQS).

[62] 36 C.F.R. § 800.16(l)(2).

[63] See footnote 61.

[64] Tribe's WQS: See provisions E.3.ii. and E.4.iv.

[65] Tribe's WQS: See provision E.2.iii.

[66] Tribe's WQS: See provision E.2.ii.

Bad River Tribe's Natural Resources Department
Attn: Water Resources Specialist
P.O. Box 39
Odanah, WI 54861

e. An operator proposing to discharge to an Exceptional Resource Water (or Tier 2 water) under the CGP must comply with the antidegradation provisions of the Tribe's WQS. Exceptional Resource Waters, or Tier 2 waters, include the following: any surface water within the exterior boundaries of the Reservation that is not specifically classified as an Outstanding Resource Water (Tier 2.5 water) or an Outstanding Tribal Resource Water (Tier 3 water).[67] The antidegradation demonstration materials described in provision E.4.ii. must be submitted to the following address:

Bad River Tribe's Natural Resources Department
Attn: Water Resources Specialist
P.O. Box 39
Odanah, WI 54861

f. Projects utilizing cationic treatment chemicals[68] within the Bad River Reservation boundaries are not eligible for coverage under the CGP.[69]

g. A discharge to a surface water within the Bad River Reservation boundaries shall not cause or contribute to an exceedance of the turbidity criterion included in the Tribe's WQS, which states: Turbidity shall not exceed 5 NTU over natural background turbidity when the background turbidity is 50 NTU or less, or turbidity shall not increase more than 10% when the background turbidity is more than 50 NTU.[70]

h. All projects which are eligible for coverage under the CGP within the exterior boundaries of the Bad River Reservation must comply with the Bad River Reservation Wetland and Watercourse Protection Ordinance, or Chapter 323 of the Bad River Tribal Ordinances, including the erosion and sedimentation control, natural buffer, and stabilization requirements. Questions regarding Chapter 323 and requests for permit applications can be directed to the Wetlands Specialist in the Tribe's Natural Resources Department at (715) 682-7123 or wetlands@badriver-nsn.gov.

i. An operator of a project, which is eligible for coverage under the CGP, that would result in an allowable discharge under the CGP occurring within the exterior boundaries of the Bad River Reservation must notify the Tribe prior to the commencing earth-disturbing activities.[71, 72] The operator must submit a copy of the Notice of Intent (NOI) to the following addresses at the same time it is submitted to the U.S. EPA:

[67] Tribe's WQS: See provision E.2.i.

[68] See definition of cationic treatment chemicals in Appendix A of the CGP.

[69] Tribe's WQS: See provisions E.6.ii.a. and E.6.ii.c.

[70] Tribe's WQS: See provision E.7.iii.

[71] See footnote 61.

[72] See footnote 62.

Bad River Tribe's Natural Resources Department
Attn: Water Resources Specialist
P.O. Box 39
Odanah, WI 54861

Bad River Tribe's Natural Resources Department
Attn: Tribal Historic Preservation Officer (THPO)
P.O. Box 39
Odanah, WI 54861

The operator must also submit a copy of the Notice of Termination (NOT) to the above addresses at the same time it is submitted to the U.S. EPA.

j. The Tribal Historic Preservation Officer (THPO) must be provided 30 days to comment on the project.[73]

k. The operator must obtain THPO concurrence in writing. This written concurrence will outline measures to be taken to prevent or mitigate effects to historic properties. For more information regarding the specifics of the cultural resources process, see 36 CFR Part 800. A best practice for an operator is to consult with the THPO during the planning stages of an undertaking.[74]

l. An operator of a project, which is eligible for coverage under the CGP, that would result in an allowable discharge under the CGP occurring within the exterior boundaries of the Bad River Reservation must submit a copy of the Stormwater Pollution Prevention Plan (SWPPP) to the following address at the same time as submitting the NOI: [75]

Bad River Tribe's Natural Resources Department
Attn: Water Resources Specialist
P.O. Box 39
Odanah, WI 54861

m. Any corrective action reports that are required under the CGP must be submitted to the following address within one (1) working day of the report completion: [76]

Bad River Tribe's Natural Resources Department
P.O. Box 39
Odanah, WI 54861

n. An operator shall be responsible for meeting any additional permit requirements imposed by the U.S. EPA necessary to comply with the Tribe's antidegradation policies if the discharge point is located upstream of waters designated by the Tribe.[77]

[73] 36 C.F.R. § 800.3(c)(4).

[74] 36 C.F.R. § 800.3(b).

[75] See footnote 61.

[76] See footnote 61.

[77] See footnote 61.

9.3.2.2 Lac du Flambeau Band of Lake Superior Tribe of Chippewa Indians: The following conditions apply only to discharges on the Lac du Flambeau Band of the Lake Superior Tribe of Chippewa Indians Reservation:

a. A copy of the Stormwater Pollution Prevention Plan must be submitted to the following office, for the Traival environmental review process, at least thirty (30) days in advance of sending the Notice of Intent (NOI) to EPA:

Lac du Flambeau
Tribal Land Management
P.O. Box 279
Lac du Flambeau, WI 54538

CGP applicants are encouraged to work with the LdF Water Resources Program in the identification of all proposed receiving waters.

b. Copies of the NOI and the Notice of Termination (NOT) must be sent to the LdF Water Resources Program at the same time they are submitted to EPA.

c. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in the Water Quality Standards of the Lac du Flambeau Reservation. This includes, but is not limited to, the prevention of any discharge that cause a condition in which visible solids, bottom deposits, or turbidity impairs the usefulness of water of the Lac du Flambeau Reservation for any of the uses designated in the Water Quality Standards of the Lac du Flambeau Reservation.

d. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the Lac du Flambeau Reservation. All spills must be reported to the appropriate emergency management agency, and measures shall be taken immediately to prevent the pollution of waters of the Lac du Flambeau reservation, including groundwater.

e. This certification does not authorize impacts to cultural, historical, or archeological features or sties, or properties that may be eligible for such listing.

f. Due to the significant ecological and cultural importance of the Lac du Flambeau Reservation, any operator requesting a permit for a point source discharge of pollutants (i.e., discharge) associated with the Stormwater Discharge will need a stormwater pollution prevention plan in place that does not violate Lac du Flambeau Water Quality Standards to protect Reservation Waters.

9.4 EPA Region 6

9.4.1 NMR100000 State of New Mexico, except Indian country

a. If construction dewatering activities are anticipated at a site, permittees must complete the following steps:

i. Investigative information must be documented in the facility SWPPP.

ii. Refer to the GWQB Mapper at https://gis.web.env.nm.gov/GWQB/ AND the PSTB Mapper (Go Mapper) at https://gis.web.env.nm.gov/GoNM/

and check if the following sources are located within the noted distance from your anticipated construct site groundwater dewatering activity:

Project Location Relative to a Source of Potential Groundwater Contamination	***Constituents likely to be required for testing***
Within 0.5 mile of an open Leaking Underground Storage Tank (LUST) site	*BTEX (Benzene, Toluene, Ethylbenzene, and Xylene) plus additional parameters depending on site conditions.**
Within 0.5 mile of an open Voluntary Remediation site	*All parameters listed in Appendix A (or an alternate list approved by the NMED SWQB)***
Within 0.5 mile of an open RCRA Corrective Action Site	
Within 0.5 mile of an open Abatement Site	
Within 0.5 mile of an open Brownfield Site	
Within 1.0 mile or more of a Superfund site or National Priorities List (NPL) site with associated groundwater contamination.	

**For further assistance determining whether dewatering may encounter impacted groundwater, the permittee may contact the NMED Ground Water Quality Bureau at: 505-827-2965.*

***EPA approved-sufficiently sensitive methods must be used - approved methods are listed in 40 CFR Part 136.3.*

ii. Indicate on the NOI that dewatering activities are anticipated. Provide information on flow and potential to encounter impacted groundwater.

iii. Permittee must test the quality of the groundwater according to the chart above. Hardness and pH must also be measured.

iv. Permittee must send test result data to EPA Region 6 and the NMED Surface Water Quality Bureau. If the test data exceed standards, it cannot be discharged from the construction site into surface waters under this permit. Discharge to surface waters must be conducted under a separate NPDES individual permit to ensure proper treatment and disposal.

v. If disposal will be to the ground surface or in an unlined pond, the permittee must submit an NO/ to the NMED Ground Water Quality Bureau.

b. Operators are not eligible to obtain authorization under this permit for all new and existing storm water discharges to outstanding national resource waters (ONRWs) (also referred to as "Tier 3" waters.)

c. Operators who intend to obtain authorization under this permit for new and existing storm water discharges from construction sites must satisfy the following condition:

i. The SWPPP must include site-specific interim and permanent stabilization, managerial, and structural solids, erosion and sediment control best management practices (BMPs) and/or other controls that are designed to prevent to the maximum extent practicable an increase in the sediment yield and flow velocity from pre-construction, pre-development conditions to assure that applicable standards in 20.6.4.NMAC, including the antidegradation policy, or TMDL waste load allocations (WLAs) are met. This requirement applies to discharges both during construction and after construction operations have been completed. The SWPPP must identify

and document the rationale for selecting these BMPs and/or other controls. The SWPPP must also describe design specifications, construction specifications, maintenance schedules (including a long term maintenance plan), criteria for inspections, and expected performance and longevity of these BMPs. For sites greater than 5 acres in size, BMP selection must be made based on the use of appropriate soil loss prediction models (i.e. SEDCAD, RUSLE, SEDIMOT, MULTISED, etc.) OR equivalent generally accepted (by professional erosion control specialists) soil loss prediction tools.

ii. For all sites, the operator(s) must demonstrate, and include documentation in the SWPPP, that implementation of the site-specific practices will assure that the applicable standards or TMDL WLAs are met, and will result in sediment yields and flow velocities that, to the maximum extent practicable, will not be greater than the sediment yield levels and flow velocities from preconstruction, pre-development conditions.

iii. All SWPPPs must be prepared in accordance with good engineering practices by qualified (e.g. CPESC certified, engineers with appropriate training) erosion control specialists familiar with the use of soil loss prediction models and design of erosion and sediment control systems based on these models (or equivalent soil loss prediction tools). Qualifications of the preparer (e.g., professional certifications, description of appropriate training) must be documented in the SWPPP. The operator(s) must design, implement, and maintain BMPs in the manner specified in the SWPPP.

d. Permittees can call 505-827-9329 for emergencies at any time and 505-476-6000 for non-emergencies during business hours from 5am-5pm, Monday through Friday.

9.4.2 NMR10I000 Indian country within the State of New Mexico, except Navajo Reservation Lands that are covered under Arizona permit AZR10I000 and Ute Mountain Reservation Lands that are covered under Colorado permit COR10I000.

9.4.2.1 Pueblo of Isleta. The following conditions apply only to discharges on the Pueblo of Isleta Reservation:

a. CGP at 1.3 Prohibited discharges: Stormwater discharges associated with construction activity that EPA or the Pueblo of Isleta, prior to authorization under this perm it, determines will cause, have the reasonable potential to cause, or may reasonably be expected to contribute to a violation or excursion of any applicable water quality standard, including the antidegradation policy, or the impairment of a designated use of receiving waters are not authorized by this permit.

b. CGP at 1.4.1 How to Submit Your NOI: The operator shall provide a copy of the Notice of Intent ("NOI") to the Pueblo of Isleta at the same time it is submitted to the U.S. Environmental Protection Agency, for projects occurring within the exterior boundaries of the Pueblo of Isleta. The operator shall also notify the Pueblo of Isleta when it has submitted the Notice of Termination ("NOT"). The NOI and NOT shall be sent to the Pueblo of Isleta at the following address:

Water Quality Control Officer
Pueblo of Isleta
Environment Department
PO Box 1270

Isleta, NM 87022
(505) 869-9819
E-mail: POI36871@isletapueblo.com

Overnight/Express Mail Delivery
Pueblo of Isleta
Environment Department
6 Sagebrush St.
Albuquerque, NM 87105

c. CGP at 1.5 Requirement to post a notice of your permit coverage: Amend to read: "You must post a sign or other notice of your permit coverage at a safe, publicly accessible location in close proximity to the construction site. The notice must be located so that it is visible from the public road or tribal road that is nearest to the active part of the construction site…"

d. CGP at 7.2.6 Description of stormwater controls: The SWPPP will be considered to be incomplete if the operator has not coordinated requirements under this Part with the Pueblo of Isleta Environment Department.

e. CGP I.12.6.1 at pg.I-6 of 8. The Pueblo of Isleta requests notification within 10 hours (rather than 24 hrs.) if health or the environment become endangered.

f. CGP at I.12.2 Anticipated noncompliance: Amend to read: "You must give advance notice to EPA and the Pueblo of Isleta at the address indicated in 1.4.1(a) of any planned changes in the permitted facility or activity which may results in noncompliance with permit requirements."

g. CGP at I.12.6.1: Any noncompliance for projects within the exterior boundaries of the Pueblo of Isleta which may endanger health or the environment shall be reported directly to the EPA Regional Office [(see contacts at https://www2.epa.gov/national-pollutant-discharge-elimination-system-npdes/contact-us-stormwater#regional)I and to the Pueblo of Isleta Water Quality Control Officer. Any information must be provided orally with n 12 hours of the time you become aware of the circumstances. Other requirements of this Part for a written submission apply. Electronic communication (E-mail) shall be provided as soon as practical. Verbal notice shall be provided to:

Water Quality Control Officer
Pueblo of Isleta
E-mail: POI36871@isletapueblo.com
(505) 869-9819
(505) 917-8346 mobile
(505) 869-3030 Police Dispatch

h. CGP at 2.2 Erosion and sediment control requirements: Erosion and sediment controls shall be designed to retain sediment on-site.

i. CGP at 2.2 Under Sediment control requirements, Standard Permit Condition Duty to Mitigate Volumes of sediment at or over (five) 5 cubic yards must be removed and placed for disposal within a tribally approved sediment Disposal Site, located on Pueblo of Isleta lands. CGP 2.2 at pg. 8.

j. Under Minimize erosion, a permittee must secure permission from the Pueblo or affected Pueblo of Isleta land assignment owner if a dissipation device needs to

be placed up- or down- elevation of a given construction site. CGP 2.2.11 at pg. 11.

k. CGP at 2.3.6 Emergency spill notification requirements: You must notify the Pueblo of Isleta Water Quality Control Officer and National Response Center (NRC) [at (800) 424-8802 or, in the Washington, DC metropolitan area, call (202) 267-2675 in accordance with the requirements of 40 CFR 110, 40 CFR 117, and 40 CFR 302] as soon as you have knowledge of the release. Verbal and electronic notice shall be provided as specified in I.12.6.1

l. CGP at C.3 Equivalent analysis waiver: Parties wishing to apply for an Equivalent Analysis Waiver (see Appendix D, Section C) must provide a copy of the waiver analysis to the Pueblo of Isleta Water Quality Control Officer at the address indicated in 1.4.1 (a).

9.4.2.2 Pueblo of Sandia. The following conditions apply only to discharges on the Pueblo of Sandia Reservation:

a. Only those activities specifically authorized by the CGP are authorized by the Pueblo of Sandia's Water Quality certification. The Pueblo of Sandia's Water Quality Certification does not authorize impact to cultural properties, historical sites or properties that may be eligible as such.

b. Copies of all Notices of Intent (NOI) submitted to the EPA must also be sent concurrently to the Pueblo of Sandia at the following address. Discharges are not authorized by this permit unless an accurate and complete NOI has been submitted to the Pueblo of Sandia, either by mail or electronically.

Regular U.S. Delivery Mail:
Pueblo of Sandia Environment Department
Attention: Scott Bulgrin, Water Quality Manager
481 Sandia Loop
Bernalillo, New Mexico 87004

Electronically:
sbulgrin@sandiapueblo.nsn.us

c. Any correspondences between the applicant and EPA related to analytical data, written reports, corrective action, enforcement, monitoring, or an adverse incident written reports should likewise be routed to the Pueblo of Sandia at the above address.

d. The Stormwater Pollution Prevention Plan (SWPPP) must be available to the Pueblo of Sandia Environment Department either electronically or hard copy upon request for review. The SWPPP must be made available at least fourteen (14) days before construction begins. The fourteen (14) day period will give Pueblo staff time to become familiar with the project site, prepare for construction site inspections, and determine compliance with the Pueblo of Sandia Water Quality Standards. Failure to provide a SWPPP to the Pueblo of Sandia may result in the delay or denial of the construction project.

e. If requested by the Pueblo of Sandia Environment Department, the permittee must provide additional information necessary for a case-by-case eligibility determination to assure compliance with the Pueblo of Sandia Water Quality Standards and/or applicable Federal Standards not authorized by this certification.

f. An "Authorization to Proceed Letter" with site specific mitigation requirements may

be sent out to the permittee when a review of the NOI and SWPPP, on a case- by-case basis is completed by the Pueblo of Sandia Environment Department. This approval will allow the application to proceed if all mitigation requirements are met.

g. The Pueblo of Sandia will not allow Small construction Waivers (Appendix C) or the Rainfall Erosivity Waiver (Appendix C.1) to be granted for any small construction activities.

h. Before submitting a Notice of Termination (NOT) to the EPA, permittees must clearly demonstrate to the Pueblo of Sandia Environment Department through a site visit or documentation that requirements for site stabilization have been met and any temporary erosion control structures have been removed. A short letter stating the NOT is acceptable and all requirements have been met will be sent to the permittee to add to the permittee's NOT submission to EPA.

i. Copies of all NOT submitted to the EPA must also be sent concurrently to the Pueblo of Sandia through the mail or electronically.

Regular U.S. Delivery Mail:
Pueblo of Sandia Environment Department
Attention: Scott Bulgrin, Water Quality Manager
481 Sandia Loop
Bernalillo, New Mexico 87004

Electronically:
sbulgrin@sandiapueblo.nsn.us

j. The Pueblo of Sandia may require the permittee to perform water quality monitoring for pH, turbidity, and total suspended solids (TSS) during the permit term if the discharge is to a surface water leading to the Rio Grande for the protection of public health and the environment.

9.4.2.3 Pueblo of Santa Ana. The following conditions apply only to discharges on the Pueblo of Santa Ana Reservation:

a. The permittee shall provide a copy of the Notice of Intent (NOI) to the Pueblo of Santa Ana (the Pueblo), at the same time it is submitted to the U.S. Environmental Protection Agency (EPA), for projects with discharges onto the lands of the Pueblo as defined in the Pueblo's antidegradation policy within the Pueblo of Santa Ana Water Quality Standards.

b. The permittee shall provide a final copy of the Stormwater Pollution Prevention Plan (SWPPP) to the Pueblo that is associated with any project identified in the NOI, at the same time that an NOI is submitted to the EPA. The SWPPP should include any projects with discharges onto the lands of the Pueblo as defined in

the antidegradation policy within the Pueblo of Santa Ana Water Quality Standards.

c. The operator shall provide copies of inspections reports and of corrective action reports to the Pueblo at the address below for review, upon request.

d. Upon completion of the project identified in the NOI, the permittee will submit a Notice of Termination (NOT) to the Pueblo.

e. All required or requested permittee specific information identified above shall be submitted to the following address:

Pueblo of Santa Ana Department of Natural Resources,
Attention: Water Resources Division
2 Dove Road
Santa Ana Pueblo, NM 87004

f. Discharges are not authorized by permittee unless an accurate and complete NOI and SWPPP have been submitted to the Pueblo. Failure to provide an accurate and complete NOI and SWPPP may result in a denial of the discharge permit or a delay in groundbreaking or construction.

g. The permittee will not proceed with site work until authorized by the Pueblo. The Pueblo requires review of the complete and final SWPPP before authorization to proceed. The Pueblo will provide an "Authorization to Process" notice after review and approval of the SWPPP.

h. The permittee could be required to perform water quality monitoring, sampling or analysis during the active permit dates for constituents determined by the Pueblo.

i. Before submitting a NOT, permittees must certify to the Pueblo's Department of Natural Resources in writing that requirements for site stabilization have been met, and any temporary erosion control structures have been removed. Documentation of the Pueblo's review that such requirements have been reviewed and met will be provided for the permittee to add to the permittee's NOT submission to EPA. Copies of all NOT submitted to the EPA must also be sent to the Pueblo at the address provided above.

9.4.2.4 Pueblo of Santa Clara. The following conditions apply only to discharges on the Pueblo of Santa Clara Reservation:

a. The operator must provide a copy of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Santa Clara Pueblo Governor's Office at the same time it is provided to the US Environmental Protection Agency.

b. A copy of the Storm water Pollution Prevention Plan shall be made available to the Pueblo of Santa Clara staff upon request.

9.4.2.5 Pueblo of Tesuque. The following conditions apply only to discharges on the Pueblo of Tesuque Reservation:

a. Based on the Section 401 Certification provisions within the CWA, no discharges that will exceed or cause the exceedance of the Pueblo of Tesuque Water Quality Standards will be allowed within the boundaries of the Pueblo of Tesuque.

b. The operator shall provide a copy of the Notice of Intent (NOI) to the Pueblo of Tesuque Governor's Office in care of the Department of Environmental and Natural Resources (DENR) at the same time it is submitted to the Environmental

Protection Agency, for projects occurring within the boundaries of Tesuque tribal lands. The operator shall also notify the Pueblo of Tesuque Governor's Office in care of the DENR when it submits the Notice of Termination (NOT), but not before the DENR post-construction inspection has been completed as described below. The NOI and NOT shall be sent to the following address:

Pueblo of Tesuque
Office of the Governor
Attn: DENR
20 TP828 Administration Bldg.
Santa Fe, NM 87506-5512

Alternatively, the operator may arrange with DENR to email the documents.

c. The operator shall also provide a copy of the Stormwater Pollution Prevention Plan, copies of inspection reports, and copies of corrective action reports to the DENR.

d. Construction requiring this permit will not commence until the above document submissions have been made and DENR provides the operator with notice to proceed. Operators will not demobilize until DENR personnel inspect the site for complication of stabilization. Once the inspection has taken place and all SWPPP-related work has been completed to the satisfaction of DENR, the operator will submit its NOT as described above and then demobilize.

9.4.2.6 Taos Pueblo. The following conditions apply only to discharges on the Taos Pueblo Reservation:

a. The operator shall provide a copy of the Notice of Intent (NOI) to the Taos Pueblo Governor's Office, War Chief's Office and Environmental Office, at the same time it is submitted to the U.S. Environmental Protection Agency, for projects occurring within the exterior boundaries of Taos Pueblo. The operator shall also notify Taos Pueblo when it has submitted the Notice of Termination (NOT). The NOI and NOT shall be sent to the Taos Pueblo at the following addresses:

i. Taos Pueblo Governor's Office
P.O. Box 1846
Taos NM 87571

ii. Taos Pueblo War Chief's Office
P.O. Box 2596
Taos NM 87571

iii. Environmental Office
Attn: Program Manger
P.O. Box 1846
Taos NM 87571

b. Taos Pueblo requests that in the event Indian artifacts or human remains are inadvertently discovered on projects occurring near or on Taos Pueblo lands that consultation with the tribal Governor's Office occur at the earliest possible time.

c. The operator shall provide a copy of the Stormwater Pollution Prevention Plan, copies of inspections reports, and copies of corrective action reports to staff in the Taos Pueblo Environmental Office for review and copy, upon request.

9.4.2.7 Ohkay Owingeh. The following conditions apply only to discharges on the Ohkay Owingeh Reservation:

a. Prior to commencement of any construction activity on Ohkay Owingeh Lands requiring permit coverage under EPA's Construction General Permit, the operator(s) shall submit to Ohkay Owingeh Office of Environmental Affairs, a copy of the electronic "Notice of Intent," submitted to the Environmental Protection Agency, immediately following EPA's electronic notification that the NOI has been received. A copy of the Stormwater Pollution Prevention Plan(s) must be made available to the Ohkay Owingeh Office of Environmental Affairs upon the tribe's request either electronically or hard copy. Operator(s) shall also submit to Ohkay Owingeh Office of Environmental Affairs a copy of the electronic Notice of Termination (NOT) submitted to the Environmental Protection Agency. Documents shall be submitted to Ohkay Owingeh at the following address:

Ohkay Owingeh Office of Environment Affairs
Attention: Environmental Programs Manager
P.O. Box 717
Ohkay Owingeh, New Mexico 87566
Office # 505.852.4212
Fax # 505.852.1432
Electronic mail: naomi.archuleta@ohkay.org

b. Ohkay Owingeh will not allow the Rainfall Erosivity Waivers (see Appendix C) to be granted for any small construction activities.

c. All vegetation used to prevent soil loss, seeding or planting of the disturbed area(s) to meet the vegetative stabilization requirements must utilize native seeds/vegetation commonly known to the area. All temporary erosion control structures, such as silt fences must be removed as soon as stabilization requirements are met.

9.4.2.8 Pueblo of Laguna. The following conditions apply only to discharges on the Pueblo of Laguna Reservation:

a. The operator must provide a paper and electronic copy of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Pueblo of Laguna at the same time it is provided to the U.S. Environmental Protection Agency. The NOI and NOT should be provided to the following address:

Pueblo of Laguna, Office of the Governor
Attn: Environmental & Natural Resources Department
P.O. Box 194
Laguna, NM 87026

Email: setter@pol-nsn.gov

b. The operator must provide an electronic copy of the Storm Water Pollution

Prevention Plan to the Pueblo of Laguna Environmental Program at the same time the NOI is submitted to the above listed email addresses. Any correspondences between the applicant and EPA related to analytical data, written reports, corrective action, enforcement, monitoring, or an adverse incident written reports threshold likewise be routed to the Pueblo of Laguna Environmental Program.

c. Immediate initiation of consultation with the Pueblo of Laguna is required should any human remains or artifacts be unearthed during the project that fall under the Native American Graves Protection and Repatriation Act guidelines. If human remains are unearthed, contact the Pueblo of Laguna Police Department at 505.552.6666. If artifacts are unearthed, contact the Pueblo of Laguna Tribal Historic Preservation Office at 505.552.5033.

9.4.2.9 Picuris Pueblo. The following conditions apply only to discharges on the Picuris Pueblo Reservation:

a. The operator, landowner and construction operators doing earth-disturbance work must meet the definition of "operator" under the Construction General Permit (CGP), and must provide an electronic and paper copy of the Notice of Intent (NOI) and Notice of Termination (NOT) to **both** The Office of the Picuris Pueblo Governor and the Picuris Pueblo Environmental Department at the same time it is provided to the U.S. Environmental Protection Agency (USEPA). The NOI and NOT should be provided to the following address:

Picuris Pueblo
The Office of the Governor
PO BOX 127
Penasco, NM 87553
575-587-2519
575-587-1071 (Fax)
Governor: governor@picurispueblo.org

Picuris Pueblo Environmental Department
PO BOX 158
Penasco, NM 87553
575-587-0110
575-587-0223 (Fax)
Environmental Director: environment@picurispueblo.org

b. The operator must provide an electronic copy of the Storm Water Pollution Prevention Plan to the Picuris Pueblo Environmental Department at least 30 days prior to submitting the NOI to USEPA and the Picuris Pueblo by email to Picuris Pueblo Environmental Department: environment@picurispueblo.org.

9.4.2.10 Pueblo of Pojoaque. The following conditions apply only to discharges on the Pueblo of Pojoaque Reservation:

a. The operator, landowner and construction operators doing earth-disturbance work must meet the definition of "operator" under the CGP and must provide a copy of the Notice of Intent (NOI) to the Pueblo of Pojoaque Governor's Office and Environmental Department within 3 days following U.S. Environmental Protection Agency's electronic confirmation that the NOI was certified and submitted and is undergoing its 14-day review period. Additionally, a copy of the Notice of Termination (NOT) must be provided the same day electronic confirmation is

received from the U.S. Environmental Protection Agency that the NOT has been accepted. The NOI and NOT should be provided to the following address:

Pueblo of Pojoaque
Office of the Governor
78 Cities of Gold Road
Santa Fe, NM 87506

Pueblo of Pojoaque
Environmental Department
39 Camino Del Rincon
Santa Fe, NM 87506

b. The operator must provide an electronic copy of the Stormwater Pollution Prevention Plans to the Pueblo of Pojoaque Environmental Department by email to Adam L Duran (aduran@pojoaque.org) at least 30 days prior to submitting the NOI to EPA and the Pueblo of Pojoaque.

9.4.2.11 Nambe Pueblo. The following conditions apply only to discharges on Nambe Pueblo:

a. The operator must provide a copy of the Notice of Intent (NOI) and Notice of Termination (NOT) to the Nambe Pueblo Governor's Office at the same time it is provided to the US Environmental Protection Agency. The NOI and NOT should be provided to the following address:

Office of the Governor
Nambe Pueblo
15A NP102 WEST
Nambe Pueblo, NM 87506

b. The operator must provide a copy of the Stormwater Pollution Prevention Plan to Nambe Pueblo at the same time it is submitted to the EPA, either by email to srydeen@nambepueblo.org or mailed to the above address.

9.4.3 OKR10I000 Indian country within the State of Oklahoma

9.4.3.1 Pawnee Nation. The following conditions apply only to discharges within Pawnee Indian country:

a. Copies of the Notice of Intent (NOI) and Notice of Termination (NOT) must be provided to the Pawnee Nation at the same time it is submitted to the Environmental Protection Agency to the following address:

Pawnee Nation Department of Environmental Conservation and Safety
P.O. Box 470
Pawnee, OK 74058
Or email to mmatlock@pawneenation.org

b. The Storm Water Pollution Prevention Plan must be available to Departmental inspectors upon request.

c. The Department must be notified at 918-762-3655 immediately upon discovery of any noncompliance with any provision of the permit conditions.

9.4.4 OKR10F000 Discharges in the State of Oklahoma that are not under the authority of the Oklahoma Department of Environmental Quality, including activities associated with oil and gas exploration, drilling, operations, and pipelines (includes SIC Groups 13 and 46, and SIC codes 492 and 5171), and point source discharges associated with agricultural production, services, and silviculture (includes SIC Groups 01, 02, 07, 08, 09).

a. For activities located within the watershed of any Oklahoma Scenic River, including the Illinois River, Flint Creek, Barren Fork Creek, Upper Mountain Fork, Little Lee Creek, and Lee Creek or any water or watershed designated "ORW" in Oklahoma's Water Quality Standards, this permit may only be used to authorize discharges from temporary construction activities. Certification is denied for any on-going activities such as sand and gravel mining or any other mineral mining.

b. For activities located within the watershed of any Oklahoma Scenic River, including the Illinois River, Flint Creek, Barren Fork Creek, Upper Mountain Fork, Little Lee Creek, and Lee Creek or any water or watershed designated "ORW" in Oklahoma's Water Quality Standards, certification is denied for any discharges originating from support activities, including concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, or borrow areas.

c. In order to company with Oklahoma's Water Quality Standards, these conditions and restrictions also apply to any construction projects located wholly or partially on Indian Country lands within the State of Oklahoma.

9.5 EPA Region 8

9.5.1 COR10I000 Indian country within the State of Colorado, as well as the portion of the Ute Mountain Reservation located in New Mexico.

9.5.1.1 The Ute Mountain Ute Tribe. The following conditions apply only to discharges on the Ute Mountain Ute Reservation.

a. Permittees must send the Stormwater Pollution Prevention Plan (SWPPP) to the Tribal Environmental Department for review and approval at least 30 days before construction starts.

b. Before submitting the Notice of Termination (NOT), permittees must clearly demonstrate to the Tribal Environmental Department during an on-site inspection that requirements for site stabilization have been met.

c. The permittee must send a copy of the Notice of Intent (NOI) and the Tribal Environmental Department.

d. Permittees may submit their SWPPPs and NOI and NOT requests electronically to: clarrick@utemountain.org.

e. Written NOIs, SWPPPs, and NOTs may be mailed to:

Colin Larrick, Water Quality Program Manager
Ute Mountain Ute Tribe
Environmental Department
P.O. Box 448
Towaoc, CO 81334

9.5.2 MTR10I000 Indian country within the State of Montana

9.5.2.1 The Confederated Salish and Kootenai Tribes of the Flathead Nation. The following conditions apply only to discharges on the Confederated Salish and Kootenai Tribes of the Flathead Nation Reservation:

a. Permittees must submit the Stormwater Pollution Prevention Plan (SWPPP) to the Confederated Salish and Kootenai Tribes at least 30 days before construction starts.

b. Before submitting the Notice of Termination (NOT), permittees must clearly demonstrate to an appointed Tribal staff person during an onsite inspection that requirements for site stabilization have been met.

c. The permittee must send a copy of the Notice of Intent (NOI) and the NOT to CSKT.

d. Permittees may submit their SWPPPs, NOIs and NOTs electronically to: clintf@cskt.org.

e. Written SWPPPs, NOIs and NOTs may be mailed to:

Clint Folden, Water Quality Regulatory Specialist
Confederated Salish and Kootenai Tribes
Natural Resources Department
P.O. Box 278
Pablo, MT 59855

9.6 EPA Region 9

9.6.1 AZR10I000 Indian Country within the state of Arizona, as well as Navajo Nation lands in New Mexico and Utah

9.6.1.1 Navajo Nation. The following conditions apply only to discharges on the Navajo Nation reservation:

a. Courtesy copies of Notice of Intents and stormwater pollution prevention plans shall be made available to Navajo EPA.

b. Copies of all monitoring reports must be provided to Navajo EPA.

c. Facilities covered under the CGP will be subject to compliance inspections by Navajo EPA staff with active Federal Inspector Credentials under the authority of the Clean Water Act.

d. Specific awareness and adherence to Sections 201 – Anti-degradation Policy, 203 – Narrative WQS, and 207.H - Turbidity.

9.6.2 CAR10I000 Indian country within the State of California

9.6.2.1 Twenty-Nine Palms Band of Mission Indians. The following conditions apply only to discharges on the Twenty-Nine Palms Band of Mission Indians Reservation:

a. At the time the applicant submits its Notice of Intent (NOI) to the EPA, the applicant must concurrently submit written notification of the NOI and a copy of the Stormwater Pollution Prevention Plan (SWPPP) to the Twenty-Nine Palms Band of Mission Indians at the address below:

Tribal Environmental Coordinator
Twenty-Nine Palms Band of Mission Indians
46-200 Harrison Place

Coachella, CA 92236

b. The applicant must also concurrently submit to the Tribal Environmental Coordinator written notification of any other forms or information submitted to the EPA, including waivers, reporting, and Notice of Termination (NOT).

c. Permitted entities under the CGP must keep the Tribal EPA informed of authorized discharges under the CGP by submitting written information about the type, quantity, frequency and location, intended purpose, and potential human health and/or environmental effects of their activities. These requirements are pursuant to Section 4 of the Twenty-Nine Palms Band of Mission Indians Water Pollution Control Ordinance (022405A). This information may be submitted to Tribal EPA in the form of Stormwater Pollution Prevention Plans (SWPPPs), monitoring reports, or other reports as required under the CGP. Spills, leaks, or unpermitted discharges must be reported in writing to Tribal EPA within 24 hours of the incident.

9.6.2.2 Morongo Band of Mission Indians. The following conditions apply only to discharges on the Morongo Band of Mission Indians Reservation:

a. This certification does not exempt, and is provisional upon compliance with, other applicable statutes and codes administered by federal and tribal agencies. Pursuant to the Morongo Band of Mission Indians Surface Water Quality Protection Ordinance (Ordinance 39), all unpermitted discharges must be reported to the Morongo Band of Mission Indians Environmental Protection Department (Morongo EPD) within 24 hours of the incident.

b. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) and stormwater pollution prevention plan (SWPPP) to the Morongo EPD at the same time it is submitted electronically to the EPA.

c. The operator shall allow the Morongo EPD or its designee to inspect and sample at the construction site as needed.

Correspondence should be submitted to:

Morongo Band of Mission Indians
Environmental Protection Department
12700 Pumarra Road
Banning, CA 92220
Phone: (951) 755-5128
Email: epd@morongo-nsn.gov

9.6.3 GUR100000 Island of Guam. The following conditions apply only to discharges on the Island of Guam:

a. Any earth-moving operations which require a permit must be obtained from the Department of Public Works (DPW) with clearance approval from various Government of Guam Agencies including Guam EPA prior to the start of any earth-moving activity.

b. In the event that the construction sites are within the Guam Sole Source Aquifer, the construction site owner and operator must consider opportunities to facilitate groundwater recharge for construction and post-construction implementing infiltration Best Management Practices. Stormwater disposal systems shall be designed and operated within the boundaries of the project. Stormwater systems shall not be permitted within any Wellhead Protection Zone unless the discharge meets the Guam Water Quality Standards within the zone. Waters discharged

within the identified category G-2 recharge zone shall receive treatment to the degree required to protect the drinking water quality prior to it entering the category G-1 resource zone.

c. All conditions and requirements set forth in the 22 Guam Administrative Rules and Regulations (GARR), Division II, Water Control, Chapter 10, Guam Soil Erosion and Sediment Control Regulations (GSESCR) that are more protective than the CGP regarding construction activities must be complied with.

d. All standards and requirements set forth in the 22 GARR, Division II, Water Control, Chapter 5, *Guam Water Quality Standards (GWQS) 2001 Revisions*, must be complied with to include reporting GWQS exceedance to Guam EPA.

e. All operators/owners of any property development or earth moving activities shall comply with the erosion control pre-construction and post-construction BMP design performance standards and criteria set forth in the 2006 CNMI and Guam Stormwater Management Manual.

f. All conditions and requirements regarding dewatering activities set forth in 22 Guam Administrative Rules and Regulations Chapter 7, Water Resources Development and Operating Regulations must be complied with to include securing permits with Guam EPA prior to the start of any dewatering activities.

g. If a project to be developed is covered under the Federal Stormwater Regulations (40 CFR Parts 122 & 123), a Notice of Intent (NOI) to discharge stormwater to the surface and marine waters of Guam must be submitted to the U.S. EPA and a copy furnished to Guam EPA, pursuant to Section 10, 104(B)(5)(d) 22GAR, Division II, Chapter 10.

h. Guam EPA shall apply the Buffer Requirements listed in Appendix G of the CGP NPDES Permit for construction activities as it pertains to Waters of the U.S. in Guam. Guam EPA shall also apply the same buffer requirements for sinkholes in Guam.

i. When Guam EPA, through its permit review process, identifies that the proposed construction activity is close proximity to marine waters, contractors and owners will be informed that any activity that may impair water quality are required to stop during peak coral spawning periods as per the Guam Coral Spawning Construction Moratoriums.

j. The Proposed Construction General Permit must set appropriate measures and conditions to protect Guam's Threatened and Endangered Species and Outstanding Resource Waters of exceptional recreational or ecological significance as determined by the Guam EPA Administrator as per *Guam Water Quality Standards 2001 Revisions,* §5102, Categories of Waters, D. Outstanding Resource Waters.

k. When Guam EPA through its permit review process identifies that proposed construction activity is in close proximity to any Section 303d impaired waters, which includes marine waters and surface waters, shall ensure that construction activity does not increase the impaired water's ambient parameters.

l. When Rainfall Erosivity and TMDL Waivers reflected in the CGP, Appendix C, are submitted to the U.S. EPA, Guam EPA will review waivers on a project by project basis.

m. Prior to submission of the Notice of Termination (NOT) to the U.S. EPA, permittees must clearly demonstration to Guam EPA that the project site has met all soil

stabilization requirements and removal of any temporary erosion control as outlined in the GSESCR.

9.7 EPA Region 10

9.7.1 IDR100000 State of Idaho, except Indian country

a. *Idaho's Antidegradation Policy*. The WQS contain an antidegradation policy providing three levels of protection to water bodies in Idaho (IDAPA 58.01.02.051).

1. Tier I Protection. The first level of protection applies to all water bodies subject to Clean Water Act jurisdiction and ensures that existing uses of a water body and the level of water quality necessary to protect those existing uses will be maintained and protected (IDAPA 58.01.02.051.01; 58.01.02.052.01). Additionally, a Tier 1 review is performed for all new or reissued permits or licenses (IDAPA 58.01.02.052.05).
2. Tier II Protection. The second level of protection applies to those water bodies considered high quality and ensures that no lowering of water quality will be allowed unless deemed necessary to accommodate important economic or social development (IDAPA 58.01.02.051.02; 58.01.02.052.08).
3. Tier III Protection. The third level of protection applies to water bodies that have been designated outstanding resource waters and requires that activities not cause a lowering of water quality (IDAPA 58.01.02.051.03; 58.01.02.052.09).

DEQ is employing a water body by water body approach to implementing Idaho's antidegradation policy. This approach means that any water body fully supporting its beneficial uses will be considered high quality (IDAPA 58.01.02.052.05.a). Any water body not fully supporting its beneficial uses will be provided Tier I protection for that use, unless specific circumstances warranting Tier II protection are met (IDAPA 58.01.02.052.05.c). The most recent federally approved Integrated Report and supporting data are used to determine support status and the tier of protection (IDAPA 58.01.02.052.05).

b. *Pollutants of Concern.* The primary pollutants of concern associated with stormwater discharges from construction activities are sediment, typically measured as total suspended solids and turbidity. Other potential pollutants include the following: phosphorus, nitrogen, pesticides, organics, metals, PCBs, petroleum products, construction chemicals, and solid wastes.

c. *Receiving Water Body Level of Protection.* The CGP provides coverage to construction activities throughout the entire State of Idaho. Because of the statewide applicability, all of the jurisdictional waters within Idaho could potentially receive discharges either directly or indirectly from activities covered under the CGP. DEQ applies a water body by water body approach to determine the level of antidegradation a water body will receive.

All waters in Idaho that receive discharges from activities authorized under the CGP will receive, at minimum Tier I antidegradation protection because Idaho's antidegradation policy applies to all waters of the state. Water bodies that fully support their aquatic life or recreational uses are considered to be *high quality waters* and will receive Tier II antidegradation protection.

Although Idaho does not currently have any Tier III designated outstanding resource waters (ORWs) designated, it is possible for a water body to be designated as an ORW during the life of the CGP. Because of this potential, the antidegradation review also assesses whether the permit complies with the

outstanding resource water requirements of Idaho's antidegradation policy.

To determine the support status of the receiving water body, persons filing a Notice of Intent (NOI) for coverage under this general permit must use the most recent EPA-approved Integrated Report, available on Idaho DEQ's website: http://www.deq.idaho.gov/water-quality/surface-water/monitoring-assessment/integrated-report/.

High quality waters are identified in Categories 1 and 2 of the Integrated Report. If a water body is in either Category 1 or 2, it is a Tier II water body.

Unassessed waters are identified as Category 3 of DEQ's Integrated Report. These waters require a case-by-case determination to be made by DEQ based on available information at the time of the application for permit coverage. If a water body is unassessed, the applicant is directed to contact DEQ for assistance in filing the NOI.

Impaired waters are identified in Categories 4 and 5 of the Integrated Report. Category 4(a) contains impaired waters for which a TMDL has been approved by EPA. Category 4(b) contains impaired waters for which controls other than a TMDL have been approved by EPA. Category 5 contains waters which have been identified as "impaired," for which a TMDL is needed. These waters are Tier I waters, for the use which is impaired. With the exception, if the aquatic life uses are impaired for any of these three pollutants—dissolved oxygen, pH, or temperature—and the biological or aquatic habitat parameters show a health, balanced biological community, then the water body shall receive Tier II protection, in addition to Tier I protection, for aquatic life uses (IDAPA 58.01.02.052.05.c.i.).

DEQ's webpage also has a link to the state's map-based Integrated Report which presents information from the Integrated Report in a searchable, map-based format: http://www.deq.idaho.gov/assistance-resources/maps-data/.

Water bodies can be in multiple categories for different causes. If assistance is needed in using these tools, or if additional information/clarification regarding the support status of the receiving water body is desired, the operator is directed to make contact with the appropriate DEQ regional office of the State office in the table below:

Regional and State Office	**Address**	**Phone Number**	**Email**
Boise	1445 N. Orchard Rd., Boise 83706	208-373-0550	Kati.carberry@deq.idaho.gov
Coeur d'Alene	2110 Ironwood Parkway, Coeur D'Alene 83814	208-769-1422	June.bergquist@deq.idaho.gov
Idaho Falls	900 N. Skyline, Suite B., Idaho Falls 83402	208-528-2650	Troy.saffle@deq.idaho.gov

Lewiston	1118 "F" St., Lewiston 83501	208-799-4370	Mark.sellet@deq.idaho.gov
Pocatello	444 Hospital way, #300 Pocatello 83201	208-236-6160	Lynn.vanevery@deq.idaho.gov
Twin Falls	650 Addison Ave., W., Suite 110, Twin Falls 83301	208-736-2190	Balthasar.buhidar@deq.idaho.gov
State Office	1410 N. Hilton Rd., Boise 83706	208-373-0502	Nicole.deinarowicz@deq.idaho.gov

d. *Turbidity Monitoring.* The permittee must conduct turbidity monitoring during construction activities and thereafter on days where there is a direct discharge of pollutants from an unstabilized portion of the site which is causing a visible plume to a water of the U.S.

A properly and regularly calibrated turbidimeter is required for measurements analyzed in the field (preferred method), but grab samples may be collected and taken to a laboratory for analysis. If the permittee can demonstrate that there will be no direct discharge from the construction site, then turbidity monitoring is not required. When monitoring is required, a sample must be taken at an undisturbed area immediately upstream of the project area to establish background turbidity levels for the monitoring event. Background turbidity, location, date and time must be recorded prior to monitoring downstream of the project area. A sample must also be taken immediately downstream from any point of discharge and *within* any visible plume. The turbidity, location, date and time must be recorded. The downstream sample must be taken immediately following the upstream sample in order to obtain meaningful and representative results.

Results from the compliance point sampling or observation[78] must be compared to the background levels to determine whether project activities are causing an exceedance of state WQS. If the downstream turbidity is 50 NTUs or more than the upstream turbidity, then the project is causing an exceedance of WQS. *Any exceedance of the turbidity standard must be reporting to the appropriate DEQ regional office within 24 hours. The following six (6) steps should be followed to ensure compliance with the turbidity standard:*

1. If a visible plume is observed, quantify the plume by collecting turbidity measurements from within the plume and compare the results to Idaho's instantaneous numeric turbidity criterion (50 NTU over the background).

[78] A visual observation is only acceptable to determine whether BMPs are functioning properly. If a plume is observed, the project may be causing an exceedance of WQS and the permittee must collect turbidity data and inspect the condition of the projects BMPs. If the BMPs appear to be functioning to their fullest capability and the turbidity is 50 NTUs or more than the upstream turbidity, then the permittee must modify the activity or implement additional BMPs (this may also include modifying existing BMPs).

2. If turbidity is less than 50 NTU instantaneously over the background turbidity; continue monitoring as long as the plume is visible. If turbidity exceeds background turbidity by more than 50 NTU instantaneously then stop all earth disturbing construction activities and proceed to step 3.
3. Take immediate action to address the cause of the exceedance. That may include inspection the condition of project BMPs. If the BMPs are functioning to their fullest capability, then the permittee must modify project activities and/or BMPs to correct the exceedance.
4. Notify the appropriate DEQ regional office within 24 hours.
5. Possibly increase monitoring frequency until state water quality standards are met.
6. Continue earth disturbing construction activities once turbidity readings return to within 50 NTU instantaneously and 25 NTU for more than ten consecutive days over the background turbidity.

Copies of daily logs for turbidity monitoring must be available to DEQ upon request. The report must describe all exceedances and subsequent actions taken, including the effectiveness of the action.

e. *Reporting of Discharges Containing Hazardous Materials or Petroleum Products.* All spills of hazardous material, deleterious material or petroleum products which may impact waters (ground and surface) of the state shall be immediately reported. Call 911 if immediate assistance is required to control, contain or clean up the spill. If no assistance is needed in cleaning up the spill, contact the appropriate DEQ regional office in the table below during normal working hours or Idaho State Communications Center after normal working hours. If the spilled volume is above federal reportable quantities, contact the National Repose Center.

For immediate assistance: Call 911

National Response Center: (800) 424-8802

Idaho State Communications Center: (208) 632-8000

Regional office	Toll Free Phone Number	Phone Number
Boise	888-800-3480	208-373-0321
Coeur d'Alene	877-370-0017	208-769-1422
Idaho Falls	800-232-4635	208-528-2650
Lewiston	977-547-3304	208-799-4370
Pocatello	888-655-6160	208-236-6160
Twin Falls	800-270-1663	208-736-2190

9.7.2 IDR10I000 Indian country within the State of Idaho, except Duck Valley Reservation lands (see Region 9)

9.7.2.1 Shoshone-Bannock Tribes. The following conditions apply only to discharges on the Shoshone-Bannock Reservation:

f. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the Shoshone-Bannock Tribes Water Resources Department at the same time it is

submitted electronically to the Environmental Protection Agency (EPA) and shall provide the Shoshone-Bannock Tribes Water Resources Department the acknowledgement of receipt of the NOI from the EPA within 7 calendar days of receipt from the EPA.

9.7.3 WAR10F000 Areas in the State of Washington, except those located on Indian country, subject to construction activity by a Federal Operator. The following conditions apply only to discharges on federal facilities in the State of Washington:

a. Discharges shall not cause or contribute to a violation of surface water quality standards (Chapter 173-201A WAC), groundwater quality standards (Chapter 173-200 WAC), sediment management standards (Chapter 173-204 WAC), and human health-based criteria in the National Toxics Rule (40 CFR Part 131.36). Discharges that are not in compliance with these standards are not authorized.

b. Prior to the discharge of stormwater and non-storm water to waters of the State, the Permittee must apply all known, available, and reasonable methods of prevention, control, and treatment (AKART). This includes the preparation and implementation of an adequate SWPPP, with all appropriate BMPs installed and maintained in accordance with the SWPPP and the terms and conditions of this permit.

c. Permittees who discharge to segments of waterbodies listed as impaired by the State of Washington under Section 303(d) of the Clean Water Act for turbidity, fine sediment, phosphorus, or pH must comply with the following numeric effluent limits:

Parameter Identified in 303{d) Listing	Parameter Sampled	Unit	Analytical Method	Numeric Effluent Limit
• Turbidity • Fine Sediment • Phosphorus	Turbidity	NTU	SM2130 or EPA 180.1	25 NTUs at the point where the stormwater is discharged from the site.
High pH	pH	Su	pH meter	In the range of 6.5 – 8.5

d. All references and requirements associated with Section 303(d) of the Clean Water Act mean the most current EPA approved listing of impaired waters that exists on February 16, 2017, or the date when the operator's complete permit application is received by EPA, whichever is later.

e. Discharges to waterbodies subject to an applicable Total Maximum Daily Load (TMDL) for turbidity, fine sediment, high pH, or phosphorus, shall be consistent with the assumptions and requirements of the TMDL.

   i. Where an applicable TMDL sets specific waste load allocations or requirements for discharges covered by this permit, discharges shall be consistent with any specific waste load allocations or requirements establish by the applicable TMDL.

   ii. Where an applicable TMDL has established a general waste load allocation for construction stormwater discharges, but no specific requirements have been identified, compliance with this permit will be assumed to be consistent with the approved TMDL.

iii. Where an applicable TMDL has not specified a waste load allocation for construction stormwater discharges, but has not excluded these discharges, compliance with this permit will be assumed to be consistent with the approved TMDL.

iv. Where an applicable TMDL specifically precludes or prohibits discharges from construction activity, the operator is not eligible for coverage under this permit.

v. Applicable TMDL means a TMDL for turbidity, fine sediment, high pH, or phosphorus, which has been completed and approved by EPA prior to February 16, 2017, or prior to the date the operator's complete NOI is received by EPA, whichever is later.

9.7.4 WAR10I000 Indian country within the State of Washington

9.7.4.1 Confederated Tribes of the Colville Reservation. The following conditions apply only to discharges on the Colville Indian Reservation (CIR) and on other Tribal trust lands or allotments of the Confederated Tribes of the Colville Reservation:

a. A copy of the Stormwater Pollution Prevention Plan must be submitted to the following office at least thirty (30) days in advance of sending the Notice of Intent (NOI) to EPA:

Environmental Trust Department
Confederated Tribes of the Colville Reservation
PO Box 150
Nesepelem, WA 99155

b. Copies of the Notice of Intent (NOI) and Notice of Termination (NOT) must be sent to the ETD at the same time they are submitted to EPA.

c. Discharges to Omak Creek, the Okanogan River, and Columbia River downstream of Chief Joseph Dam may affect threatened or endangered species, and shall only be permitted in adherence with Appendix D of the CGP.

d. All work shall be carried out in such a manner as will prevent violations of water quality criteria as stated in Chapter 4-8 Water Quality Standards of the Colville Law and Order Code, as amended.

e. Appropriate steps shall be taken to ensure that petroleum products or other chemical pollutants are prevented from entering waters of the CIR. All spills must be reported to the appropriate emergency management agency and the ETD, and measures shall be taken immediately to prevent the pollution of waters of the CIR, including groundwater.

f. Stormwater site inspections shall be conducted at least once every 7 calendar days, within 24-hours of the occurrence of a rain event of 0.25 inches or greater in a 24-hour period, and daily during periods of saturated ground surface or snowmelt with accompanying surface runoff.

g. Results of discharge sampling must be reported to the ETD within 7 days of sample collection. All sample reporting must include the date and time, location, and individual performing the sampling.

h. Any corrective action reports that are required under the CGP must be submitted to the ETD at the above address within one (1) working day of the report completion.

i. This certification does not authorize impacts to cultural, historical, or archeological features or sites, or proprieties that may be eligible for such listing.

9.7.4.2 Lummi Nation. The following conditions apply only to discharges on the Lummi Reservation:

a. The Lummi Nation reserves the right to modify this 401 certification if the final version of the NPDES General Permit for Storm Water Discharges Associated with Construction Activity (CGP) on tribal lands in the State of Washington (Permit No. WAR10I000) is substantively different than the draft version of the proposed permit that was made available for public comments during April 2016. The Lummi Nation will determine if the final version of the NPDES CGP is substantively different than the draft version following review of the final version once the EPA makes it available.

b. This certification does not exempt and is provisional upon compliance with other applicable statutes and codes administered by federal and Lummi tribal agencies. Pursuant to Lummi Code of Laws (LCL) 17.05.020(a), the operator must also obtain a land use permit from the Lummi Planning Department as provided in Title 15 of the Lummi Code of Laws and regulations adopted thereunder.

c. Pursuant to LCL 17.05.020(a), each operator shall develop and submit a Storm Water Pollution Prevention Plan to the Lummi Water Resources Division for review and approval by the Water Resources Manager prior to beginning any discharge activities.

d. Pursuant to LCL Title 17, each operator shall be responsible for achieving compliance with the Water Quality Standards for Surface Waters of the Lummi Indian Reservation (Lummi Administrative Regulations [LAR] 17 LAR 07.010 through 17 LAR 07.210 together with supplements and amendments thereto).

e. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the Lummi Water Resources Division at the same time it is submitted electronically to the Environmental Protection Agency (EPA) and shall provide the Lummi Water Resources Division the acknowledgement of receipt of the NOI from the EPA and the associated NPDES tracking number provided by the EPA within 7 calendar days of receipt from the EPA.

f. Each operator shall submit a signed hard copy of the Notice of Termination (NOT) to the Lummi Water Resources Division at the same time it is submitted electronically to the EPA and shall provide the Lummi Water Resources Division the EPA acknowledgement of receipt of the NOT.

g. Storm Water Pollution Prevention Plans, Notice of Intent, Notice of Termination and associated correspondence with the EPA shall be submitted to:

Lummi Natural Resources Department
ATTN: Water Resources Manager
2665 Kwina Road
Bellingham, WA 98226-9298

9.7.4.3 Makah Tribe. The following conditions apply only to discharges on the Makah Reservation:

a. The operator shall be responsible for achieving compliance with the Makah Tribe's Water Quality Standards.

b. The operator shall submit a Storm Water Pollution Prevention Plan to the Makah Tribe Water Quality Program and Makah Fisheries Habitat Division for review and approval at least thirty (30) days prior to beginning any discharge activities.

c. The operator shall submit a copy of the Notice of Intent to the Makah Tribe Water Quality Program and Makah Fisheries Habitat Division at the same time it is submitted to EPA.

d. Storm Water Pollution Prevention Plans and Notices of Intent shall be submitted to:

Aaron Parker
Makah Fisheries Management Water Quality Specialist
(360) 645-3162
Cell 206-356-0319
Aaron.parker@makah.com
PO Box 115
Neah Bay WA 98357

9.7.4.4 Puyallup Tribe of Indians. The following conditions apply only to discharges on the Puyallup Tribe of Indians Reservation:

a. Each permittee shall be responsible for achieving compliance with the Puyallup Tribe's Water Quality Standards, including antidegradation provisions. The Puyallup Natural Resources Department will conduct an antidegradation review for permitted activities that have the potential to lower water quality. The antidegradation review will be consistent with the Tribe's Antidegradation Implementation Procedures. The Tribe may also impose additional controls on a site-specific basis, or request EPA to require the operator obtain coverage under an individual permit, if information in the NOI or from other sources indicates that the operator's discharges are not controlled as necessary to meet applicable water quality standards.

b. The permittee shall be responsible for meeting any additional permit requirements imposed by EPA necessary to comply with the Puyallup Tribe's antidegradation policies if the discharge point is located within 1 linear mile upstream of waters designated by the Tribe.

c. Each permittee shall submit a copy of the Notice of Intent (NOI) to be covered by the general permit to Char Naylor (char.naylor@puyalluptribe.com) and Russ Ladley (russ.ladley@puyalluptribe.com) by email or at the address listed below at the same time it is submitted to EPA.

Puyallup Tribe of Indians
3009 E. Portland Avenue
Tacoma, WA 98404
ATTN: Russ Ladley and Char Naylor

d. All supporting documentation and certifications in the NOI related to coverage under the general permit for Endangered Species Act purposes shall be submitted to the Tribe's Resource Protection Manager (russ.ladley@puyalluptribe.com) and Char Naylor (char.naylor@puyalluptribe.com) for review.

e. If EPA requires coverage under an individual or alternative permit, the permittee shall submit a copy of the permit to Russ Ladley and Char Naylor at the address listed above.

f. The permittee shall submit all stormwater pollution prevention plans to Char Naylor for review and approval prior to beginning any activities resulting in a discharge to tribal waters.

g. The permittee shall conduct benchmark monitoring for turbidity (or transparency) and, in the event of significant concrete work or engineered soils, pH monitoring as well. Monitoring, benchmarks, and reporting requirements contained in Condition S.4. (pp.13-20) of the Washington State Construction Stormwater General Permit, effective January 1, 2016, shall apply, as applicable.

h. The permittee shall notify Char Naylor (253-680-5520) and Russ Ladley (253-680-5560) prior to conducting inspections at construction sites generating storm water discharged to tribal waters.

i. Treat dewatering discharges with controls necessary to minimize discharges of pollutants in order to minimize the discharge of pollutants to groundwater or surface waters from stormwater that is removed from excavations, trenches, foundations, vaults, or other storage areas. Examples of appropriate controls include sediment basins or sediment traps, sediment socks, dewatering tanks, tube settlers, weir tanks, and filtration systems (e.g., bag or sand filters) that are designed to remove sediment.

   To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. At all points where dewatering water is discharged, comply with the velocity dissipation requirements of Part 2.2.11 of EPA's 2016 General Construction Stormwater Permit. Examples of velocity dissipation devices include check dams, sediment traps, riprap, and grouted riprap at outlets.

j. The permittee shall provide and maintain natural buffers to the maximum extent possible (and/or equivalent erosion and sediment controls) when tribal waters are located within 100 feet of the site's earth disturbances. If infeasible to provide and maintain an undisturbed 100 foot natural buffer, erosion and sediment controls to achieve the sediment load reduction equivalent to a 100-foot undisturbed natural buffer shall be required.

9.7.4.5 Spokane Tribe of Indians. The following conditions apply only to discharges on the Spokane Tribe Reservation:

a. Pursuant to Tribal Law and Order Code (TLOC) Chapter 30 each operator shall be responsible for achieving compliance with the Surface Water Quality Standards of the Spokane Tribe. The operator shall notify the Spokane Tribe, Water Control Board (WCB) of any spills of hazardous material and;

b. Each operator shall submit a signed hard copy of the Notice of Intent (NOI) to the WCB at the same time it is submitted to EPA.

c. The permittee shall allow the Tribal Water Control Board or its designee to inspect and sample at the construction site as needed.

d. Each operator shall submit a signed copy of the Notice of Termination (NOT) to the WCB at the same time it is submitted to EPA.

   The correspondence address for the Spokane Tribe Water Control Board is:

   Water Control Board
   c/o. Brian Crossley
   P0 Box 480
   Wellpinit WA 99040

(509)626-4409
crossley@spokanetribe.com

9.7.4.6 Swinomish Indian Tribal Community. The following conditions apply only to discharges on the Swinomish Reservation:

a. Owners and operators seeking coverage under this permit who intend to discharge to Regulated Surface Waters must submit a copy of the Notice of Intent (NOI) to the DEP at the same time the NOI is submitted to EPA.

b. Owners and operators seeking coverage under this permit must also submit a Stormwater Pollution Prevention Plan to the DEP for review and approval by DEP prior to beginning any discharge activities.

c. Owners and operators must also submit to the DEP Changes in NOI and/or Notices of Termination at the same time they are submitted to EPA.

9.7.4.7 Tulalip Tribes. The following conditions apply only to discharges on the Tulalip Reservation:

a. This certification does not exempt and is provisional upon compliance with other applicable statues and codes administered by federal and Tulalip tribal agencies. Pursuant to Tulalip Tribes code of law, the operator must also obtain a land use permit from the Tulalip Tribes Planning Department as provided in Title 7 of the Tulalip Tribal Code (http://www.codepublishing.com/WA/Tulalip/?Tulalip02/Tulalip0205.html).

b. Each CGP operator shall be responsible for achieving compliance with Tulalip Tribes Water Quality Standards.

c. Each CGP operator shall submit their Stormwater Pollution Prevention Plan (SWPPP) to the:

Tulalip Natural & Cultural Resources Department
Tulalip Tribes
6406 Marine Drive
Tulalip, WA 98271

Appendix C – Copy of NOI and EPA Authorization email

NOI is online only.

Appendix D – Copy of Inspection Form

Stormwater Construction Site Inspection Report

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____ **Date:**_____

Appendix E – Copy of Corrective Action Form

Section A – Initial Report (CGP Part 5.4.1) (Complete this section within 24 hours of identifying the condition that triggered corrective action)					
Name of Project		**NPDES ID No.**		**Today's Date**	
Date Problem First Discovered		**Time Problem First Discovered**			
Name and Contact Information of Individual Completing this Form					

What site conditions triggered the requirement to conduct corrective action *(check the box that applies)*:

- ☐ A stormwater control needs repair or replacement (beyond routine maintenance required under Part 2.1.4)
- ☐ A stormwater control necessary to comply with the requirements of this permit was never installed, or was installed incorrectly
- ☐ A discharge is causing an exceedance of applicable water quality standards
- ☐ A Part 1.3 prohibited discharge has occurred
- ☐ EPA requires corrective action as a result of permit violations found during an EPA inspection carried out under Part 4.8

Provide a description of the problem:

Deadline for completing corrective action *(check the box that applies)*:

- ☐ Immediately take all reasonable steps to address the condition, including cleaning up any contaminated surfaces so the material will not discharge in subsequent storm events
- ☐ Complete by close of the next business day when problem does not require a new or replacement control or significant repair
- ☐ No later than 7 calendar days from the time of discovery for problems that require a new or replacement control or significant repair
- ☐ Infeasible to complete the installation or repair within 7 calendar days. Explain why it is infeasible and document schedule for installing control:

Enter date of corrective action completion: _____

Section B – Corrective Action Completion (CGP Part 5.4.2)

(Complete this section no later than 24 hours after completing the corrective action)

Section B.1 – Why the Problem Occurred

Cause(s) of Problem (Add an additional sheet if necessary)	**How You Determined the Cause and the Date You Determined the Cause**
1.	**1.**
2.	**2.**

Section B.2 – Stormwater Control Modifications Implemented to Correct the Problem

List of Stormwater Control Modification(s) Needed to Correct Problem (Add an additional sheet if necessary)	**Date of Completion**	**SWPPP Update Necessary?**	**Notes**
1.		☐Yes ☐No If yes, provide date SWPPP modified:	
2.		☐Yes ☐No If yes, provide date SWPPP modified:	

Section C –Signature and Certification (CGP Part 5.4.3)

Section C.1 – Contractor or Subcontractor Signature and Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Contractor or Subcontractor: _____

Date:

Printed Name and Affiliation: _____

Section C.2 – Operator Signature and Certification

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Signature of Operator or "Duly Authorized Representative": _____

Date:

Printed Name and Affiliation: _____

Appendix F – SWPPP Amendment Log

No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Appendix G – Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

Appendix H – Grading and Stabilization Activities Log

Date Grading Activity Initiated	**Description of Grading Activity**	**Description of Stabilization Measure and Location**	**Date Grading Activity Ceased** (Indicate Temporary or Permanent)	**Date When Stabilization Measures Initiated**

Appendix I – SWPPP Training Log

Stormwater Pollution Prevention Training Log

Project Name:

Project Location:

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ **Sediment and Erosion Controls**
- ❑ **Emergency Procedures**
- ❑ **Stabilization Controls**
- ❑ **Inspections/Corrective Actions**
- ❑ **Pollution Prevention Measures**

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		

Appendix J – Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix K – Endangered Species Documentation

Critical Habitat for Threatened & Endangered Species [USFWS]



A specific geographic area(s) that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection.

U.S. Fish and Wildlife Service | The data found in this file were developed by the U.S. Fish & Wildlife Service field offices. For more information please refer to the species level metadata found with the individual shapefiles. The ECOS Joint Development Team is responsible for creating and serving this conglomerate file. No data alterations are made by ECOS. | USDA FSA, Maxar | Esri Community Maps Contributors, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Appendix L – Historic Properties Documentation

See Appendix A - Site Maps

Appendix M – Rainfall Gauge Recording

Use the table below to record the rainfall gauge readings at the beginning and end of each work day. An example table follows.

Month/Year			Month/Year			Month/Year		
Day	Start time	End time	Day	Start time	End time	Day	Start time	End time
1			1			1		
2			2			2		
3			3			3		
4			4			4		
5			5			5		
6			6			6		
7			7			7		
8			8			8		
9			9			9		
10			10			10		
11			11			11		
12			12			12		
13			13			13		
14			14			14		
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25			25			25		
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28			28			28		
29			29			29		
30			30			30		
31			31			31		