



HDPE Pipe Handling Policy

Health and Safety FCX-HS12 | Release Date 1/18/2019

POTENTIAL FATAL RISKS

Uncontrolled Release of Energy
Lifting Operations
Vehicle Impact on Person

CRITICAL CONTROLS

- Segregation, Guards, Barriers & Barricades
- Tensioned Lines Management
- HDPE Management
- Energy Isolation
- Mechanical Integrity of Lifting Equipment
- Lifting Execution
- Vehicle Preoperational Inspection
- Positive Communication System
- Fundamentally Stable Parking

TECHNICAL SUPPLEMENTS

Pulling Force
Pipe Handling Permit
Push/Pull/Positioning Illustrations
Rigging Approval Request
Pipe Handling Engineering Review
Receiving/Loading/Unloading Checklist
Approved Rigging Assemblies

TRAINING REQUIREMENTS

All employees and contractors handling HDPE pipe must be trained in this policy and required skills
HDPE Pipe Handling (Initial and Refresher)
HYD_FCX2027C & HYD_FCX2024C
HDPE Pipe Fusing (HYD_MTI1002C)
HDPE Skills training/assessments
HDPE Datalogging (HYD_MTI1003C)
Technical Rigging (RIG_FCX1001C)
Remedial Training as necessary

POLICY

OVERVIEW

Permit is required for handling all pipe 2in. in diameter or larger and 50ft. in length or greater, including deliveries at any length.

SOPs will be developed for activities around HDPE receiving, offloading, storage, pulling and installation, and coiled pipe.

Reference documents use is mandatory.

Engineering reviews and MOC may be required for new installations or major changes.

ACTIONS TO STAY SAFE

Conduct pre-job safety reviews.

Always complete all required permits and checklists.

Verify that equipment in use has adequate lifting/pulling capacity.

Task train employees for all equipment in use with HDPE.

Follow all SOPs when working with HDPE.

All personnel must remain 50ft. (15.24m) or more away from pipe being moved or handled, or utilize substantial barriers.

Personnel directly involved with handling activities and within 50ft.

(15.24m) of HDPE must ensure pipe is controlled and blocked as necessary.

Eliminate interaction with traffic or utilize appropriate blocking during pulls.

Consider increased stored energy when bending pipe and install barriers as needed.

RECEIVING, OFFLOADING AND STORAGE

Complete load receiving/loading/unloading checklist.

Receiving personnel will coordinate with operations on all HDPE deliveries.

Establish 50ft. (15.24m) safe zone fully around truck being unloaded.

Safe zones must be demarcated.

Truck drivers will stay with safety watches when unloading HDPE.

FCX vehicles moving pipe will have engineered controls to secure pipe.

Barriers/blocking will be utilized when unstrapping pipe.

Without engineering controls:

Store pipe 10in. (.25m) in diameter or larger no more than two pipes high.

Store pipe less than 10in. (.25m) in diameter no higher than 2ft. (.61m).

PULLING OR MOVING LENGTHS OF PIPE

Complete permit before moving/pulling pipe.

Reference the approved rigging assemblies.

Never use a sling as a choker on 12in. (.3 m) or larger pipe without variance.

Never cut, slot, or shape the pipe for anchorage points.

Use escorts equipped with blue lights, spotters and blockers when pulling or moving pipe when there is a potential for interaction with traffic.

Rigging used for pulling must be identified and cannot be used for lifting.

FUSING, INSTALLATION AND REPAIR

Complete HDPE permit prior to starting work.

Never use banding clamps to splice pipe ends.

Dataloggers must be used when fusing pipe 12in. (.3m) and larger.

ENGINEERING REVIEW REQUIRED WHEN:

Pulling pipe longer than 400ft.

Pulling pipe on grades greater than 25%.

Any activities (other than loading/unloading) pipe 42in. (1.07m) and larger diameter.

Pushing pipe of any diameter or length.

All tasks involving double walled or dual contained pipe.

Cutting pipe with significant bends and/or potential stored energy.



Technical Supplement

HDPE Pipe Handling Engineering Review | HDPE Handling FCX-HS12 | Release Date 1/18/2019

| | | |
|---|-------|----------|
| <p>Please fill out the form with the reason and the detailed description for the Engineering Review Request. Approval from the division manager or higher is required prior to proceeding with the task.</p> | | |
| Date: | Site: | Div Mgr: |
| Purpose of the activity : | | |
| Description of request: | | |
| Engineering Review: (engineering must be listed below or attached) | | |
| Risk Mitigation/Control Measures: | | |
| Approval Names & Signatures | | |
| Requestor: | | |
| Reviewing Engineer: | | |
| Health and Safety: | | |
| Area Superintendent: | | |
| Division Manager: | | |
| <i>When completed, give copy of all related documentation to division record keeper for filing.</i> | | |

HDPE Pipe Handling Permit and Pre Job Hazard Analysis Approved 1/18/2019

| | | | | | |
|--|---------------------------------|---|------------------|---------------------------------|--|
| Before completing this permit, it is necessary to thoroughly review applicable policies and SOP's with all affected employees to ensure concrete understanding. Think carefully about the entire task to identify, evaluate, and control all energy sources to prevent incidents. | | | | Permit Expiration Date: | |
| Request Date: | Qualified Individual: | Department/Shop: | Location: | Equipment used for task: | |
| Pipe Specifications | Pipe Pulling Information | Task Description/Permit Purpose: | | | |
| Diameter: | Length: | | | | |
| SDR: | From: | | | | |
| Contents: | To: | | | | |

Pre Job Hazard Analysis

| Section 1: General Hazard Analysis | YES | NO | NA | Section 2: Pipe Pulling Analysis | YES | NO | NA | | |
|--|-----|----|----|---|-----|------------------------------------|-----------|----|----|
| Are all personnel working on this task properly trained to perform the work? | | | | Has appropriate rigging been identified? | | | | | |
| Have all affected departments/areas been notified? <i>List:</i> | | | | Does travel path create any bends in pipe? <i>Controls:</i> | | | | | |
| Is the pipeline buried, or is earth work required? | | | | Has travel path been identified and communicated? | | | | | |
| Is a Utility Location Permit required and completed? | | | | Does the length or path require spotters or blockers? | | | | | |
| Is a Hot Work Permit been required and completed? | | | | Section 3: Fusing/Installation/Repair Analysis | | | YES | NO | NA |
| Are substantial barrier required to protect personnel and are they adequate for this task? | | | | For multiple crews on the pipeline, is energy controlled between crews? | | | | | |
| Are all energized/ pressurized lines near the work area or travel path identified and controlled? <i>List pressurized lines and controls:</i> | | | | Will loading or unloading pipe into the fusing machine release stored energy? <i>Controls:</i> | | | | | |
| <i>List energized lines and controls:</i> | | | | Has safe access been established to the work area? | | | | | |
| | | | | Has appropriate rigging been identified? | | | | | |
| | | | | Is Datalogger connected and working properly? | | | | | |
| | | | | Section 4: Energy Source Review | | | | | |
| Has pipe contents been identified and appropriate Safety and Environmental controls in place? | | | | YES | NO | HAZARD | CONTROLS: | | |
| | | | | | | High wall/material angle of repose | | | |
| Has the pipeline been isolated? <i>LOTOTO points:</i> | | | | | | Line of fire | | | |
| Have all cut points been clearly identified by a qualified individual? | | | | | | Weather | | | |
| Will cutting release any stored energy? <i>Controls:</i> | | | | | | Uncontrolled release of energy | | | |
| | | | | | | Falls/falling objects | | | |
| Is a Safety Watch required for this task? | | | | | | Others: | | | |
| Is lighting sufficient for the task? | | | | | | | | | |

HDPE Pipe Handling Permit and Pre Job Hazard Analysis Approved 1/18/2019

| Section 5: Significant Hazard Analysis | | YES | NO | NA |
|--|--|---|----|----|
| 1. Is the pipeline 12" in diameter or greater? | | | | |
| 2. Are there any bends in the pipe that are storing significant potential energy? | | | | |
| 3. Is a substantial barrier being used for the task? | | | | |
| 4. Will two-way traffic be allowed during the pipe pull? | | | | |
| 5. Will the pipeline be pushed into place? | | | | |
| 6. Is the pipe dual walled or dual contained? | | | | |
| 7. Will pipe 12" in diameter or great be fused without a Datalogger? | | | | |
| <p>If any of the above questions have a "YES" response, superintendent signature is required. A "YES" response to question 5 or 6 requires Engineering Review. A "YES" response to question 7 requires a Variance (See DOHS SharePoint, Administrative Requirements Policy for additional information).</p> | | | | |
| Qualified Individual – Prior to Starting Task <i>(QI initials must be completed daily)</i> | | | | |
| Pre-job safety review has been completed with all employees associated with the task | | | | |
| Notification has been provided to all departments/areas | | | | |
| All personnel not involved with the task have been cleared from the area/travelway | | | | |
| QI Name: | | QI Signature | | |
| Supervisor Name (if necessary) | | Supervisor Signature (if necessary) | | |
| Superintendent Name (if necessary) | | Superintendent Signature (if necessary) | | |
| Employees associated with the task: <i>I have reviewed the above permit completely and understand the procedures, hazards and controls to complete this task safely. (Print and sign below)</i> | | | | |
| | | | | |



Technical Supplement

Receiving/Loading/Unloading Checklist | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

| | | |
|---------|-------|-------------------|
| Date: | BOL#: | Inspected By: |
| Driver: | | Load Description: |

Part 1 – HDPE Pipe Load Checklist

| | | |
|---|-----------|---|
| YES | NO | Load has not shifted and is not leaning |
| YES | NO | Trailer is equipped with stints, or pipe is loaded and strapped properly according to the HDPE Pipe Shipping Requirements |
| YES | NO | Proper size dunnage (minimum 4x4) is in place between each layer of pipe with chocks on the end |
| NOTE: If the HDPE pipe is not loaded properly or any of the above conditions have not been met (checked "No"), the truck will NOT be released for off-loading. The superintendent for the area receiving the pipe must be contacted immediately for further evaluation. | | |
| Load Approved: | | |

Part 2 – HDPE Pipe Receiving Checklist

| | | |
|---|-----------|---|
| YES | NO | Load has not shifted and is not leaning |
| YES | NO | Pipe is loaded and strapped properly according to the HDPE Pipe Shipping Requirements |
| YES | NO | Proper size dunnage (minimum 4x4) is in place between each layer of pipe with chocks on the end |
| YES | NO | Pipe is free from visible defects or damages |
| NOTE: If the HDPE pipe is not loaded properly or any of the above conditions have not been met (checked "No"), the truck will NOT be released for off-loading. The superintendent for the area receiving the pipe must be contacted immediately for further evaluation. | | |
| NOTE: All improper loads must be communicated to the PSST Site Representative and GSC | | |
| Receive and Approved: | | |

Part 3 – HDPE Pipe Unloading Checklist

| | | |
|--|-----------|---|
| YES | NO | All operators and safety watches have been task trained |
| YES | NO | Operator has completed a pre-use inspection card for equipment |
| YES | NO | Load area is free of other equipment, debris, rocks, holes, etc. |
| YES | NO | Clear access is established to both sides of the truck |
| YES | NO | Truck is sitting with wheels level and is chocked |
| YES | NO | A 50-ft safe zone has been established (or a substantial barrier is put in place) |
| YES | NO | Safety watch is in place |
| YES | NO | Driver is with the safety watch |
| YES | NO | Area where pipe will be placed is inspected |
| NOTE: Do NOT proceed with unloading if any question above is answered "No" | | |

Loading/Unloading Approval Signatures

| | | |
|--------|--------------|----------------|
| Driver | Safety Watch | Unloading Crew |
|--------|--------------|----------------|



Technical Supplement

Pipeline Pulling Force | HDPE Handling FCX-HS12 | Release Date 1/18/2019

Table 1 HDPE Pipeline Pulling Force (17.5% Grade)

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-----------------------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|----------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 or 7.3 |
| Nominal Pipe Diameter (inches) | 12 | 2,600 | 3,200 | 4,000 | 4,400 | 4,800 | 5,300 | 6,000 | 7,200 | 8,500 | 10,500 |
| | 14 | 3,200 | 3,900 | 4,800 | 5,200 | 5,800 | 6,300 | 7,200 | 8,600 | 10,300 | 12,700 |
| | 16 | 4,100 | 5,100 | 6,200 | 6,800 | 7,600 | 8,200 | 9,400 | 11,300 | 13,400 | 16,600 |
| | 18 | 5,200 | 6,400 | 7,900 | 86,300 | 9,600 | 10,400 | 11,800 | 14,200 | 17,000 | 21,000 |
| | 20 | 6,400 | 7,900 | 9,700 | 10,600 | 11,800 | 12,900 | 14,600 | 17,600 | 20,900 | 25,900 |
| | 22 | 7,700 | 9,600 | 11,700 | 12,900 | 14,300 | 15,500 | 17,700 | 21,200 | 25,300 | 31,300 |
| | 24 | 9,200 | 11,400 | 13,900 | 15,300 | 17,000 | 18,500 | 21,000 | 25,300 | 30,100 | 37,300 |
| | 26 | 10,800 | 13,300 | 16,300 | 17,900 | 19,900 | 21,700 | 24,600 | 29,600 | 35,400 | 43,600 |
| | 28 | 12,500 | 15,500 | 18,900 | 20,800 | 23,100 | 25,200 | 28,600 | 34,400 | 41,000 | |
| | 30 | 14,300 | 17,700 | 21,700 | 23,900 | 26,500 | 28,900 | 32,800 | 39,400 | 47,100 | |
| | 32 | 16,300 | 20,200 | 24,700 | 27,200 | 30,100 | 32,800 | 37,300 | 44,900 | 53,500 | |
| | 34 | 18,400 | 22,800 | 27,900 | 30,700 | 34,000 | 37,100 | 42,100 | 50,600 | | |
| | 36 | 20,600 | 25,500 | 31,300 | 34,400 | 38,100 | 41,600 | 47,200 | 56,700 | | |
| 42+ | Engineering Review Required | | | | | | | | | | |

Table 2 HDPE Pipeline Pulling Force (25% Grade)

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-----------------------------|-----------------|--------|--------|--------|---------|--------|--------|--------|--------|----------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 or 7.3 |
| Nominal Pipe Diameter (inches) | 12 | 2,800 | 3,400 | 4,200 | 4,600 | 5,100 | 5,600 | 6,300 | 7,600 | 9,000 | 11,200 |
| | 14 | 3,300 | 4,100 | 5,100 | 5,500 | 6,200 | 6,700 | 7,600 | 9,100 | 10,900 | 13,500 |
| | 16 | 4,400 | 5,400 | 6,600 | 7,200 | 8,000 | 8,700 | 9,900 | 11,900 | 14,200 | 17,600 |
| | 18 | 5,500 | 6,800 | 8,300 | 9,100 | 10,100 | 11,000 | 12,500 | 15,100 | 18,000 | 22,200 |
| | 20 | 6,800 | 8,400 | 10,300 | 11,300 | 12,500 | 13,600 | 15,500 | 18,600 | 22,200 | 27,400 |
| | 22 | 8,200 | 10,100 | 12,400 | 12,500 | 151,010 | 16,500 | 18,700 | 22,500 | 26,800 | 33,200 |
| | 24 | 9,700 | 12,000 | 14,800 | 16,200 | 18,000 | 19,600 | 22,200 | 26,800 | 31,900 | 39,500 |
| | 26 | 11,400 | 14,100 | 17,300 | 19,000 | 21,100 | 23,000 | 26,100 | 31,400 | 37,500 | 46,300 |
| | 28 | 13,200 | 16,400 | 20,100 | 22,000 | 24,500 | 26,600 | 30,300 | 36,400 | 43,400 | |
| | 30 | 15,200 | 18,800 | 23,000 | 25,300 | 28,100 | 30,600 | 34,700 | 41,800 | 49,800 | |
| | 32 | 17,300 | 21,400 | 26,200 | 28,800 | 31,900 | 34,800 | 39,500 | 47,500 | 56,700 | |
| | 34 | 19,500 | 24,100 | 29,600 | 32,500 | 36,000 | 39,300 | 44,600 | 53,700 | | |
| | 36 | 21,800 | 27,000 | 33,100 | 36,400 | 40,400 | 44,000 | 50,000 | 60,100 | | |
| 42+ | Engineering Review Required | | | | | | | | | | |

NOTES

Use in conjunction with the approved rigging assemblies. Friction factor of 0.80 used in calculations (Sand/HDPE published at 0.66).

An engineering review is required for pulling pipe on a slope greater than 14° (25%).

Pulling forces in orange exceed capacity of original six rigging assemblies.

Calculations based on pulling empty 400 ft pipeline up respective slopes, assuming 0.8 coefficient of friction.

This document must be viewed or printed in color.



Technical Supplement

Rigging Approval Request | HDPE Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging, a detailed drawing and PE stamp must be provided.

| | | |
|-----------------------|-------|----------|
| Date: | Site: | Div Mgr: |
| Rigging description : | | WLL: |

Engineering Review & Summary

| | | |
|--------------------|-------------------|----------------------|
| Pipe size and SDR: | Pipe length (ft): | Pipe yield strength: |
|--------------------|-------------------|----------------------|

When using a shackle to pipe assembly, analysis must include the following:

| | | |
|---------------------|---------------------------------|--------------------------------------|
| Shackle WLL (tons): | # of shackles attached to pipe: | Shackle pin diameter D_p (inches): |
|---------------------|---------------------------------|--------------------------------------|

| | |
|---------------------------------|---|
| Busing diameter D_p (inches): | Edge of pipe to center of hole, R (inches): |
|---------------------------------|---|

Assembly Description/Diagram:

Parts List: (include all parts such as pulling head, swivel, sling, shackle, master link, wire ropes, rotational controls, etc.)

| Ref # | Qty | Description | Supplier | Part # | WLL |
|-------|-----|-------------|----------|--------|-----|
| | | | | | |
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Name and Signatures (required for single use approval)

Engineer conducting review:

PSST Site Rep:

Division Manager:

Health and Safety:

Name and Signature (required for inclusion)

Corporate PSST Lead:

When completed, give copy of all related documentation to division record keeper for filing.



Technical Supplement

Receiving/Loading/Unloading Checklist | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

| | | |
|---------|-------|-------------------|
| Date: | BOL#: | Inspected By: |
| Driver: | | Load Description: |

Part 1 – HDPE Pipe Load Checklist

| | | |
|---|-----------|---|
| YES | NO | Has the load shifted or is it leaning? |
| YES | NO | Is the trailer is equipped with stints, or pipe is loaded and strapped properly according to the HDPE Pipe Shipping Requirements? |
| YES | NO | Is proper size dunnage (minimum 4x4) in place between each layer of pipe with chocks on the end? |
| NOTE: If the HDPE pipe is not loaded properly or any of the above conditions have not been met (checked "No"), the truck will NOT be released for off-loading. The superintendent for the area receiving the pipe must be contacted immediately for further evaluation. | | |
| Load Approved: | | |

Part 2 – HDPE Pipe Receiving Checklist

| | | |
|---|-----------|--|
| YES | NO | Has the load shifted or is it leaning? |
| YES | NO | Is pipe loaded and strapped properly according to the HDPE Pipe Shipping Requirements? |
| YES | NO | Is proper size dunnage (minimum 4x4) in place between each layer of pipe with chocks on the end? |
| YES | NO | Is pipe free from visible defects or damages? |
| NOTE: If the HDPE pipe is not loaded properly or any of the above conditions have not been met (checked "No"), the truck will NOT be released for off-loading. The superintendent for the area receiving the pipe must be contacted immediately for further evaluation. | | |
| NOTE: All improper loads must be communicated to the Pipe Safety Steering Team Site Representative and GSC | | |
| Receive and Approved: | | |

Part 3 – HDPE Pipe Unloading Checklist

| | | |
|--|-----------|---|
| YES | NO | Have all operators and safety watches been task trained? |
| YES | NO | Has operator completed a pre-use inspection card for equipment? |
| YES | NO | Is load area free of other equipment, debris, rocks, holes, etc.? |
| YES | NO | Is clear access is established on both sides of the truck? |
| YES | NO | Is truck sitting with wheels level and are chocks in place? |
| YES | NO | Has a 50-ft (15.24m) safe zone has been established (or a substantial barrier is put in place)? |
| YES | NO | Is a safety watch is in place? |
| YES | NO | Is the driver is with the safety watch? |
| YES | NO | Has the area where pipe will be placed inspected and free from hazards? |
| NOTE: Do NOT proceed with unloading if any question above is answered "No" | | |

Loading/Unloading Approval Signatures

| | | |
|--------|--------------|----------------|
| Driver | Safety Watch | Unloading Crew |
|--------|--------------|----------------|



Technical Supplement

Rigging Approval Request | HDPE Handling FCX-HS12 | Release Date 1/18/2019

| Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging, a detailed drawing and PE stamp must be provided. | | | | | |
|---|-----|---|----------|--------------------------------------|-----|
| Date: | | Site: | | Div Mgr: | |
| Rigging description : | | | | WLL: | |
| Engineering Review & Summary | | | | | |
| Pipe size and SDR: | | Pipe length (ft): | | Pipe yield strength: | |
| When using a shackle to pipe assembly, analysis must include the following: | | | | | |
| Shackle WLL (tons): | | # of shackles attached to pipe: | | Shackle pin diameter D_p (inches): | |
| Busing diameter D_p (inches): | | Edge of pipe to center of hole, R (inches): | | | |
| Assembly Description/Diagram: | | | | | |
| Parts List: (include all parts such as pulling head, swivel, sling, shackle, master link, wire ropes, rotational controls, etc.) | | | | | |
| Ref # | Qty | Description | Supplier | Part # | WLL |
| | | | | | |
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| | | | | | |
| Name and Signatures (required for single use approval) | | | | | |
| Engineer conducting review: | | | | | |
| PSST Site Rep: | | | | | |
| Division Manager: | | | | | |
| Health and Safety: | | | | | |
| Name and Signature (required for inclusion) | | | | | |
| Corporate PSST Lead: | | | | | |
| <i>When completed, give copy of all related documentation to division record keeper for filing.</i> | | | | | |



Technical Supplement

Fused Pulling Head, 5t Swivel Assembly A | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

| | | |
|---|--------------------------------|--------------------------------|
| Date: 4/25/2016 | Site: Company PSST | Division Manager: Company PSST |
| Description of Rigging: HDPE Fused Pulling Head, 5-Ton Swivel | Working Load Limit: 16,667 lbs | |

Engineering Review:

The rigging described here is one of the six original rigging assemblies (Rigging Assembly "A")

Alternative rigging equipment and supplier may be substituted as long as they have:

- Equivalent function
- Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

Engineering Review Summary

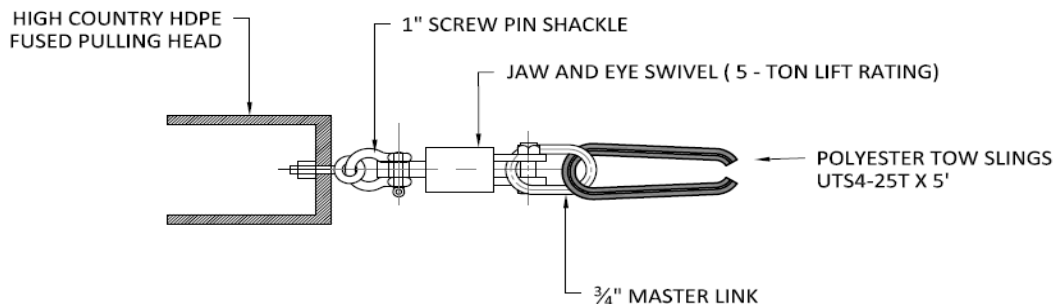
| | | |
|---|---------------------|--------------------------|
| Pipe Diameter and SDR: See Attached Table | Pipe Length: 400-ft | Pipe Yield Strength: n/a |
|---|---------------------|--------------------------|

When using a shackle to pipe assembly analysis must include the following:

| | | |
|-----------------------------------|---|---------------------------------------|
| Shackle's Working Load Limit: | Shackles Attached to Pipe (number): | Shackle Pin Diameter, D_p (inches): |
| Bushing Diameter, D_p (inches): | Hole Diameter in HDPE Pipe, D_h (inches): | Shackle Gap Opening Width, W : |
| Opening Length, L : | Edge of Pipe to Center of Hole, R : | |

Assembly Description/Diagram:

(this must be listed below or attached on a separate sheet)



(A) HDPE FUSED PULLING HEAD, 5- TON SWIVEL

Parts List:

Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---------------------------------------|---------------|------------------|--------------------|
| n/a | 1 | High Country HDPE Fused Pulling Head | Polywarehouse | See Support Docs | 16,667 lbs |
| n/a | 1 | Jaw and Eye Swivel, 5-ton Lift Rating | Certex | CX05-0259 | 16,667 lbs |
| n/a | As Needed | 3/4" Master Link | Certex | CX05-0708 | 16,667 lbs |
| n/a | As Needed | 1" Screw Pin Shackle | Certex | CX10-0026 | 16,667 lbs |
| n/a | 1 | Polyester Tow Sling UTS4-25T x 5-ft | Certex | CX08-0039-5 | 16,667 lbs |

A) HDPE Fused Pulling Head, 5-ton Swivel

| | | Pipe SDR Rating | | | | | | | | | | |
|--------------------------------|-----|-----------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|--------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 | |
| Nominal Pipe Diameter (inches) | 12 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 14 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 16 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green | Yellow |
| | 18 | Green | Green | Green | Green | Green | Green | Green | Green | Red | Red | Red |
| | 20 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Red | Red |
| | 22 | Green | Green | Green | Green | Green | Green | Red | Red | Red | Red | Red |
| | 24 | Green | Green | Green | Green | Red | Red | Red | Red | Red | Red | Red |
| | 26 | Green | Green | Yellow | Red | Red | Red | Red | Red | Red | Red | Red |
| | 28 | Green | Green | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| | 30 | Green | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| | 32 | Yellow | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| | 34 | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red |
| 36 | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | Red | |

| | |
|--------|---|
| Green | Rigging can be used on grades up to 25% |
| Yellow | Rigging can be used on grades up to 17.5% |
| Red | Rigging cannot be used |

A) HDPE Fused Pulling Head, 5-ton Swivel

| | | Pipe SDR Rating | | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|---|---|---|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 | |
| Nominal Pipe Diameter (inches) | 12 | X | X | X | X | X | X | X | X | X | X | X |
| | 14 | X | X | X | X | X | X | X | X | X | X | X |
| | 16 | X | X | X | X | X | X | X | X | X | X | O |
| | 18 | X | X | X | X | X | X | X | X | X | X | X |
| | 20 | X | X | X | X | X | X | X | X | X | X | X |
| | 22 | X | X | X | X | X | X | X | X | X | X | X |
| | 24 | X | X | X | X | X | X | X | X | X | X | X |
| | 26 | X | X | O | X | X | X | X | X | X | X | X |
| | 28 | X | X | X | X | X | X | X | X | X | X | X |
| | 30 | X | X | X | X | X | X | X | X | X | X | X |
| | 32 | O | X | X | X | X | X | X | X | X | X | X |
| | 34 | X | X | X | X | X | X | X | X | X | X | X |
| 36 | X | X | X | X | X | X | X | X | X | X | X | |

| | |
|-------|---|
| X | Rigging can be used on grades up to 25% |
| O | Rigging can be used on grades up to 17.5% |
| Black | Rigging cannot be used |



Technical Supplement

Single 1 1/2" Skookum Shackel, Bushing, 5t Swivel Assembly B | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

| | | |
|--|--------------------------------|--------------------------------|
| Date: 4/25/2016 | Site: Company PSST | Division Manager: Company PSST |
| Description of Rigging: Single 1 - 1/2" Skookum Shackle, Bushing, 5-Ton Swivel | Working Load Limit: 16,667 lbs | |

Engineering Review:

The rigging described here is one of the six original rigging assemblies (Rigging Assembly "B")

Alternative rigging equipment and supplier may be substituted as long as they have:

- Equivalent function
- Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

Engineering Review Summary

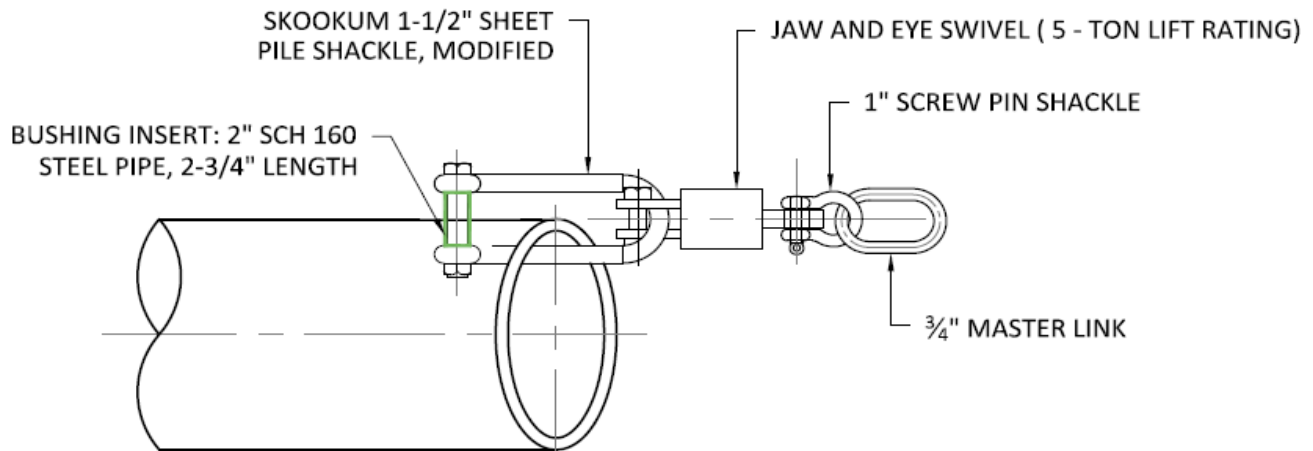
| | | |
|---|---------------------|--------------------------|
| Pipe Diameter and SDR: See Attached Table | Pipe Length: 400-ft | Pipe Yield Strength: n/a |
|---|---------------------|--------------------------|

When using a shackle to pipe assembly analysis must include the following:

| | | |
|---|---|---|
| Shackle's Working Load Limit: 33,333 lbs | Shackles Attached to Pipe (number): 1 | Shackle Pin Diameter, <i>D_p</i> (inches): 1.625" |
| Bushing Diameter, <i>D_p</i> (inches): 2.375" | Hole Diameter in HDPE Pipe, <i>D_h</i> (inches): 2.5" | Shackle Gap Opening Width, <i>W</i> : 2.87" |
| Opening Length, <i>L</i> : 9.5" | Edge of Pipe to Center of Hole, <i>R</i> : 8" | |

Assembly Description/Diagram:

(this must be listed below or attached on a separate sheet)



Parts List:

Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---|----------|----------------|--------------------|
| n/a | 1 | Skookum 1-1/2" Sheet Pile Shackle, modified | Certex | CX10-0778-HAG1 | 33,333 lbs |
| n/a | 1 | Bushing Insert: 2" SCH160 Steel Pipe, 2-3/4" Length | | | |
| n/a | 1 | Jaw and Eye Swivel, 5-Ton Lift Rating | Certex | CX05-0259 | 16,667 lbs |
| n/a | As Needed | 1" Screw Pin Shackle | Certex | CX10-0026 | 16,667 lbs |
| n/a | 1 | Polyester Tow Sling UTS4-25T x 5-ft | Certex | CX08-0039-5 | 16,667 lbs |
| n/a | As Needed | 3/4" Master Link | Certex | CX05-0708 | 16,667 lbs |

B) Single 1-1/2 Skookum Shackle with 2" Sch160 Pipe Bushing Insert, 5-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|---|---|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| | 16 | | | | | | | | | | |
| | 18 | | | | | | | | | | |
| | 20 | | | | | | | | | | |
| | 22 | | | | | | | | | | |
| | 24 | | | | | | | | | | |
| | 26 | | | | | | | | | | |
| | 28 | | | | | | | | | | |
| | 30 | | | | | | | | | | |
| | 32 | | | | | | | | | | |
| | 34 | | | | | | | | | | |
| | 36 | | | | | | | | | | |

| |
|---|
| Rigging can be used on grades up to 25% |
| Rigging can be used on grades up to 17.5% |
| Rigging cannot be used |

B) Single 1-1/2 Skookum Shackle with 2" Sch160 Pipe Bushing Insert, 5-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|---|---|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | | | | | O | X | X | X | X | X |
| | 14 | | | | | O | X | X | X | X | X |
| | 16 | | | | | O | X | X | X | X | O |
| | 18 | | | | | O | X | X | X | | |
| | 20 | | | | | O | O | O | | | |
| | 22 | | | | | | | | | | |
| | 24 | | | | | | | | | | |
| | 26 | | | | | | | | | | |
| | 28 | | | | | | | | | | |
| | 30 | | | | | | | | | | |
| | 32 | | | | | | | | | | |
| | 34 | | | | | | | | | | |
| | 36 | | | | | | | | | | |

| |
|---|
| X - Rigging can be used on grades up to 25% |
| O - Rigging can be used on grades up to 17.5% |
| Rigging cannot be used |



Technical Supplement

Fused Pulling Head, 15t Swivel Assembly C | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

| | | |
|--|--------------------------------|--------------------------------|
| Date: 4/25/2016 | Site: Company PSST | Division Manager: Company PSST |
| Description of Rigging: HDPE Fused Pulling Head, 15-Ton Swivel | Working Load Limit: 50,000 lbs | |

Engineering Review:
 The rigging described here is one of the six original rigging assemblies (Rigging Assembly "C")

Alternative rigging equipment and supplier may be substituted as long as they have:

- Equivalent function
- Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

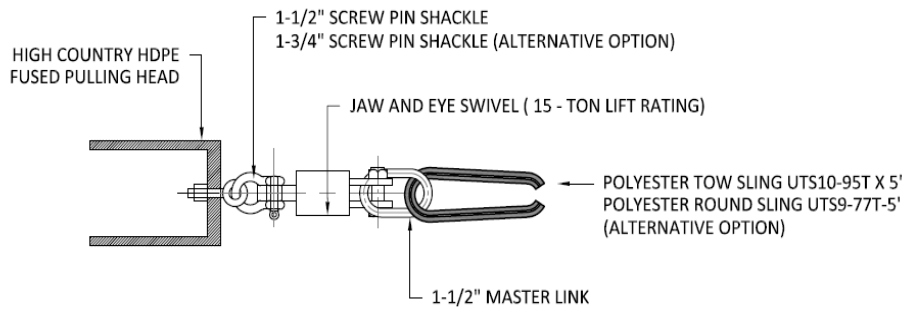
Engineering Review Summary

| | | |
|---|---------------------|--------------------------|
| Pipe Diameter and SDR: See Attached Table | Pipe Length: 400-ft | Pipe Yield Strength: n/a |
|---|---------------------|--------------------------|

When using a shackle to pipe assembly analysis must include the following:

| | | |
|-----------------------------------|---|---------------------------------------|
| Shackle's Working Load Limit: | Shackles Attached to Pipe (number): | Shackle Pin Diameter, D_p (inches): |
| Bushing Diameter, D_b (inches): | Hole Diameter in HDPE Pipe, D_h (inches): | Shackle Gap Opening Width, W : |
| Opening Length, L : | Edge of Pipe to Center of Hole, R : | |

Assembly Description/Diagram: *(this must be listed below or attached on a separate sheet)*



(C) HDPE FUSED PULLING HEAD, 15- TON SWIVEL

Parts List:

Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---|---------------|------------------|--------------------|
| n/a | 1 | High Country HDPE Fused Pulling Head | Polywarehouse | See Support Docs | 50,000 lbs |
| n/a | 1 | Jaw and Eye Swivel, 15-Ton Lift Rating | Certex | CX05-0277 | 50,000 lbs |
| n/a | As Needed | 1-1/2" Master Link | Certex | CX05-0712 | 50,000 lbs |
| A | As Needed | 1-1/2" Screw Pin Shackle | Certex | CX10-0030 | 50,000 lbs |
| B | As Needed | 1-3/4" Screw Pin Shackle (Alternative to Ref. A) | Certex | CX10-0031 | 50,000 lbs |
| C | 1 | Polyester Tow Sling UTS10-95T x 5-ft | Certex | CX08-0045-5 | 50,000 lbs |
| D | 1 | Polyester Tow Sling (Alternative to Ref. C) - UTS9-77T x 5-ft | Certex | CX08-0044-5 | 50,000 lbs |

C) HDPE Fused Pulling Head, 15-ton Swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|---|---|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | | | | | | | | | | |
| | 14 | | | | | | | | | | |
| | 16 | | | | | | | | | | |
| | 18 | | | | | | | | | | |
| | 20 | | | | | | | | | | |
| | 22 | | | | | | | | | | |
| | 24 | | | | | | | | | | |
| | 26 | | | | | | | | | | |
| | 28 | | | | | | | | | | |
| | 30 | | | | | | | | | | |
| | 32 | | | | | | | | | | |
| | 34 | | | | | | | | | | |
| 36 | | | | | | | | | | | |

Rigging can be used on grades up to 25%
Rigging can be used on grades up to 17.5%
Rigging cannot be used

C) HDPE Fused Pulling Head, 15-ton Swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|---|---|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | X | X | X | X | X | X | X | X | X | X |
| | 14 | X | X | X | X | X | X | X | X | X | X |
| | 16 | X | X | X | X | X | X | X | X | X | X |
| | 18 | X | X | X | X | X | X | X | X | X | X |
| | 20 | X | X | X | X | X | X | X | X | X | X |
| | 22 | X | X | X | X | X | X | X | X | X | X |
| | 24 | X | X | X | X | X | X | X | X | X | X |
| | 26 | X | X | X | X | X | X | X | X | X | |
| | 28 | X | X | X | X | X | X | X | X | X | |
| | 30 | X | X | X | X | X | X | X | X | X | |
| | 32 | X | X | X | X | X | X | X | X | | |
| | 34 | X | X | X | X | X | X | X | | | |
| 36 | X | X | X | X | X | X | X | | | | |

X - Rigging can be used on grades up to 25%
O - Rigging can be used on grades up to 17.5%
Rigging cannot be used



Technical Supplement

Two 1 1/2" Skookum Shackles, 15t Swivel Assembly D | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

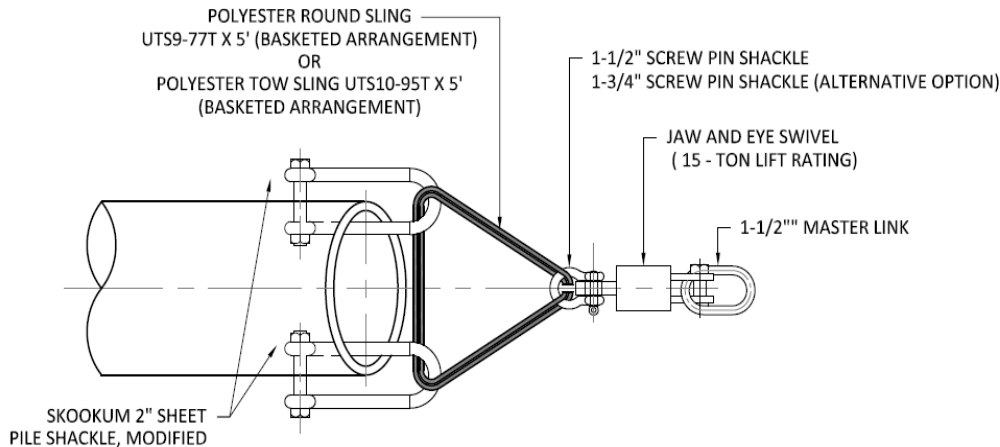
| | | | | | |
|-------------------------|--|-------|---------------------|-------------------|--------------|
| Date: | 4/25/2016 | Site: | Company PSST | Division Manager: | Company PSST |
| Description of Rigging: | Two 1 - 1/2" Skookum Shackles, 15-Ton Swivel | | Working Load Limit: | 50,000 lbs | |

Engineering Review:
 The rigging described here is one of the six original rigging assemblies (Rigging Assembly "D")
 Alternative rigging equipment and supplier may be substituted as long as they have:
 - Equivalent function
 - Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

Engineering Review Summary

| | | | | | |
|---|--------------------|--|--------|--|--------|
| Pipe Diameter and SDR: | See Attached Table | Pipe Length: | 400-ft | Pipe Yield Strength: | n/a |
| When using a shackle to pipe assembly analysis must include the following: | | | | | |
| Shackle's Working Load Limit: | 33,333 lbs | Shackles Attached to Pipe (number): | 2 | Shackle Pin Diameter, <i>D_p</i> (inches): | 1.625" |
| Bushing Diameter, <i>D_p</i> (inches): | n/a | Hole Diameter in HDPE Pipe, <i>D_h</i> (inches): | 2" | Shackle Gap Opening Width, <i>W</i> : | 2.87" |
| Opening Length, <i>L</i> : | 14.125" | Edge of Pipe to Center of Hole, <i>R</i> : | 8" | | |

Assembly Description/Diagram: *(this must be listed below or attached on a separate sheet)*



Parts List:
 Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---|----------|----------------|-----------------------|
| n/a | 2 | Skookum 1-1/2" Sheet Pile Shackle, Modified | Certex | CX10-0778-HAG1 | 50,000 lbs (per pair) |
| n/a | 1 | Jaw and Eye Swivel, 15-Ton Lift Rating | Certex | CX05-0277 | 50,000 lbs |
| n/a | As Needed | 1-1/2" Master Link | Certex | CX05-0712 | 50,000 lbs |
| A | As Needed | 1-1/2" Screw Pin Shackle | Certex | CX10-0030 | 50,000 lbs |
| B | As Needed | 1-3/4" Screw Pin Shackle (Alternative to Ref. A) | Certex | CX10-0031 | 50,000 lbs |
| C | 1 | Polyester Tow Sling (Basketed Arrangement) - UTS10-95T x 5-ft | Certex | CX08-0045-5 | 50,000 lbs |
| D | 1 | Polyester Tow Sling (Alternative to Ref. C) - UTS9-77T x 5-ft | Certex | CX08-0044-5 | 50,000 lbs |

D) Two 1-1/2" Skookum Shackles, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-------|-----------------|-------|--------|--------|--------|--------|--------|--------|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 14 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 16 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 18 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 20 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 22 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Red |
| | 24 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Red |
| | 26 | Green | Green | Green | Green | Green | Green | Green | Green | Red | Red |
| | 28 | Green | Red | Yellow | Yellow | Yellow | Yellow | Yellow | Yellow | Red | Grey |
| | 30 | Green | Red | Red | Red | Red | Red | Red | Red | Red | Grey |
| | 32 | Green | Red | Red | Red | Red | Red | Red | Red | Red | Grey |
| | 34 | Green | Red | Red | Red | Red | Red | Red | Red | Red | Grey |
| 36 | Green | Red | Red | Red | Red | Red | Red | Red | Red | Grey | |

| | |
|--------|---|
| Green | Rigging can be used on grades up to 25% |
| Yellow | Rigging can be used on grades up to 17.5% |
| Red | Rigging cannot be used |

D) Two 1-1/2" Skookum Shackles, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | Black | X | X | X | X | X | X | X | X | X |
| | 14 | Black | X | X | X | X | X | X | X | X | X |
| | 16 | Black | X | X | X | X | X | X | X | X | X |
| | 18 | Black | X | X | X | X | X | X | X | X | X |
| | 20 | Black | X | X | X | X | X | X | X | X | X |
| | 22 | Black | X | X | X | X | X | X | X | X | Black |
| | 24 | Black | X | X | X | X | X | X | X | X | Black |
| | 26 | Black | X | X | X | X | X | X | X | X | Black |
| | 28 | Black | Black | O | O | O | O | O | O | O | Black |
| | 30 | Black | Black | Black | Black | Black | Black | Black | Black | Black | Black |
| | 32 | Black | Black | Black | Black | Black | Black | Black | Black | Black | Black |
| | 34 | Black | Black | Black | Black | Black | Black | Black | Black | Black | Black |
| 36 | Black | Black | Black | Black | Black | Black | Black | Black | Black | Black | |

| | |
|-------|---|
| Black | X - Rigging can be used on grades up to 25% |
| Black | O - Rigging can be used on grades up to 17.5% |
| Black | Rigging cannot be used |



Technical Supplement

Two 1 1/2" Skookum, 2" Sch160 Bushing, 15t Swivel Assembly E | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

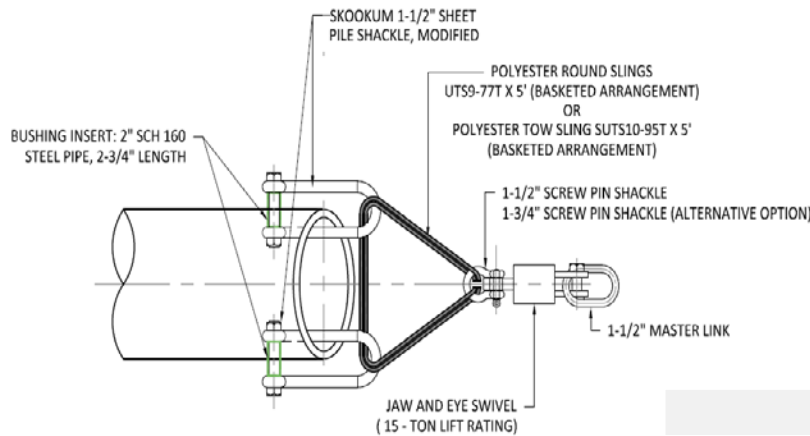
| | | | | | |
|-------------------------|---|-------|--------------|---------------------|--------------|
| Date: | 4/25/2016 | Site: | Company PSST | Division Manager: | Company PSST |
| Description of Rigging: | Two 1-1/2" Skookum Shackles w/ 2" Sch160 Pipe Bushing Insert, 15-Ton Swivel | | | Working Load Limit: | 50,000 lbs |

Engineering Review:
 The rigging described here is one of the six original rigging assemblies (Rigging Assembly "E")
 Alternative rigging equipment and supplier may be substituted as long as they have:
 - Equivalent function
 - Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

Engineering Review Summary

| | | | | | |
|---|--------------------|--|--------|--|--------|
| Pipe Diameter and SDR: | See Attached Table | Pipe Length: | 400-ft | Pipe Yield Strength: | n/a |
| When using a shackle to pipe assembly analysis must include the following: | | | | | |
| Shackle's Working Load Limit: | 33,333 lbs | Shackles Attached to Pipe (number): | 2 | Shackle Pin Diameter, <i>D_p</i> (inches): | 1.625" |
| Bushing Diameter, <i>D_p</i> (inches): | 2.375" | Hole Diameter in HDPE Pipe, <i>D_h</i> (inches): | 2.5" | Shackle Gap Opening Width, <i>W</i> : | 2.87" |
| Opening Length, <i>L</i> : | 9.5" | Edge of Pipe to Center of Hole, <i>R</i> : | 8" | | |

Assembly Description/Diagram: *(this must be listed below or attached on a separate sheet)*



Parts List:
 Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---|----------|----------------|-----------------------|
| n/a | 2 | Skookum 1-1/2" Sheet Pile Shackle, Modified | Certex | CX10-0778-HAG1 | 50,000 lbs (per pair) |
| n/a | 1 | Bushing Insert: 2" SCH160 Steel Pipe, 2-3/4" Length | | | |
| n/a | 1 | Jaw and Eye Swivel, 15-Ton Lift Rating | Certex | CX05-0277 | 50,000 lbs |
| n/a | As Needed | 1-1/2" Master Link | Certex | CX05-0712 | 50,000 lbs |
| A | As Needed | 1-1/2" Screw Pin Shackle | Certex | CX10-0030 | 50,000 lbs |
| B | As Needed | 1-3/4" Screw Pin Shackle (Alternative to Ref. A) | Certex | CX10-0031 | 50,000 lbs |
| C | 1 | Polyester Tow Sling (Basketed Arrangement) - UTS10-95T x 5-ft | Certex | CX08-0045-5 | 50,000 lbs |
| D | 1 | Polyester Tow Sling (Alternative to Ref. C) - UTS9-77T x 5-ft | Certex | CX08-0044-5 | 50,000 lbs |

E) Two 1-1/2" Skookum Shackles with 2" Sch160 Pipe Bushing Insert, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 14 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 16 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 18 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 20 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 22 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Red |
| | 24 | Green | Green | Green | Green | Green | Green | Green | Green | Red | Red |
| | 26 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Red |
| | 28 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Grey |
| | 30 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Grey |
| | 32 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Grey |
| | 34 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Grey |
| 36 | Green | Green | Green | Green | Green | Green | Green | Red | Red | Grey | |

| | |
|--------|---|
| Green | Rigging can be used on grades up to 25% |
| Yellow | Rigging can be used on grades up to 17.5% |
| Red | Rigging cannot be used |

E) Two 1-1/2" Skookum Shackles with 2" Sch160 Pipe Bushing Insert, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|----|-----------------|----|----|----|----|------|------|----|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | O | X | X | X | X | X | X | X | X | X |
| | 14 | O | X | X | X | X | X | X | X | X | X |
| | 16 | O | X | X | X | X | X | X | X | X | X |
| | 18 | O | X | X | X | X | X | X | X | X | X |
| | 20 | O | X | X | X | X | X | X | X | X | X |
| | 22 | O | X | X | X | X | X | X | X | X | Black |
| | 24 | O | X | X | X | X | X | X | X | X | Black |
| | 26 | O | X | X | X | X | X | X | X | X | Black |
| | 28 | O | X | X | X | X | X | X | X | X | Black |
| | 30 | O | X | X | X | X | X | X | X | X | Black |
| | 32 | O | X | X | X | X | X | X | X | X | Black |
| | 34 | O | X | X | X | X | X | X | X | X | Black |
| 36 | O | X | X | X | X | X | X | X | X | Black | |

| | |
|-------|---|
| White | X - Rigging can be used on grades up to 25% |
| White | O - Rigging can be used on grades up to 17.5% |
| Black | Rigging cannot be used |



Technical Supplement

Two 2" Skookum Shackles, 15t Swivel - Assembly F | HDPE Pipe Handling FCX-HS12 | Release Date 1/18/2019

Attach all supporting documentation including but not limited to drawings, PE stamps, calculations, etc. For fabricated rigging a detailed drawing and PE stamp must be provided.

| | | |
|--|--------------------------------|--------------------------------|
| Date: 4/25/2016 | Site: Company PSST | Division Manager: Company PSST |
| Description of Rigging: Two 2" Skookum Shackles, 15-Ton Swivel | Working Load Limit: 50,000 lbs | |

Engineering Review:

The rigging described here is one of the six original rigging assemblies (Rigging Assembly "F")

Alternative rigging equipment and supplier may be substituted as long as they have:

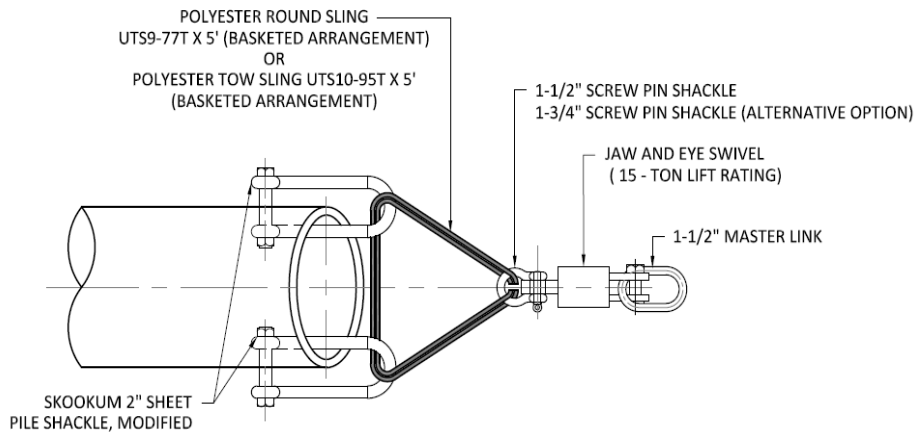
- Equivalent function
- Equivalent rating or higher (Working Load Limit must be based on a design factor of at least 1:3)

Engineering Review Summary

| | | |
|---|--|---|
| Pipe Diameter and SDR: See Attached Table | Pipe Length: 400-ft | Pipe Yield Strength: n/a |
| When using a shackle to pipe assembly analysis must include the following: | | |
| Shackle's Working Load Limit: 100,000 lb | Shackles Attached to Pipe (number): 2 | Shackle Pin Diameter, <i>Dp</i> (inches): 2.25" |
| Bushing Diameter, <i>Dp</i> (inches): | Hole Diameter in HDPE Pipe, <i>Dh</i> (inches): 2.5" | Shackle Gap Opening Width, <i>W</i> : 4" |
| Opening Length, <i>L</i> : 11.25" | Edge of Pipe to Center of Hole, <i>R</i> : 8" | |

Assembly Description/Diagram:

(this must be listed below or attached on a separate sheet)



Parts List:

Include all parts such as: pulling head, swivel, nylon sling, shackle to equipment, master link, wire rope slings, flange break strength, rotational energy controls, etc.

| Ref. # | Quantity | Item Description | Supplier | Part Number | Working Load Limit |
|--------|-----------|---|----------|---------------|--------------------|
| n/a | 2 | Skookum 2" Sheet Pile Shackle, Modified | Certex | CX10-0778-HAG | 100,000 lbs |
| n/a | 1 | Jaw and Eye Swivel, 15-Ton Lift Rating | Certex | CX05-0277 | 50,000 lbs |
| n/a | As Needed | 1-1/2" Master Link | Certex | CX05-0712 | 50,000 lbs |
| A | As Needed | 1-1/2" Screw Pin Shackle | Certex | CX10-0030 | 50,000 lbs |
| B | As Needed | 1-3/4" Screw Pin Shackle (Alternative to Ref. A) | Certex | CX10-0031 | 50,000 lbs |
| C | 1 | Polyester Tow Sling (Basketed Arrangement) - UTS10-95T x 5-ft | Certex | CX08-0045-5 | 50,000 lbs |
| D | 1 | Polyester Tow Sling (Alternative to Ref. C) - UTS9-77T x 5-ft | Certex | CX08-0044-5 | 50,000 lbs |

F) Two 2" Skookum Shackles, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 14 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 16 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 18 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 20 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 22 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 24 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Green |
| | 26 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Red |
| | 28 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Grey |
| | 30 | Green | Green | Green | Green | Green | Green | Green | Green | Green | Grey |
| | 32 | Green | Green | Green | Green | Green | Green | Green | Green | Red | Grey |
| | 34 | Green | Green | Green | Green | Green | Green | Green | Red | Grey | Grey |
| 36 | Green | Green | Green | Green | Green | Green | Green | Red | Grey | Grey | |

Green Rigging can be used on grades up to 25%
 Yellow Rigging can be used on grades up to 17.5%
 Red Rigging cannot be used

F) Two 2" Skookum Shackles, 15-ton swivel

| | | Pipe SDR Rating | | | | | | | | | |
|--------------------------------|-------|-----------------|----|----|----|----|------|-------|-------|-------|-------|
| | | 32.5 | 26 | 21 | 19 | 17 | 15.5 | 13.5 | 11 | 9 | 7 |
| Nominal Pipe Diameter (inches) | 12 | Black | X | X | X | X | X | X | X | X | X |
| | 14 | Black | X | X | X | X | X | X | X | X | X |
| | 16 | Black | X | X | X | X | X | X | X | X | X |
| | 18 | Black | X | X | X | X | X | X | X | X | X |
| | 20 | Black | X | X | X | X | X | X | X | X | X |
| | 22 | Black | X | X | X | X | X | X | X | X | X |
| | 24 | Black | X | X | X | X | X | X | X | X | X |
| | 26 | Black | X | X | X | X | X | X | X | X | Black |
| | 28 | Black | X | X | X | X | X | X | X | X | Black |
| | 30 | Black | X | X | X | X | X | X | X | X | Black |
| | 32 | Black | X | X | X | X | X | X | X | Black | Black |
| | 34 | Black | X | X | X | X | X | X | Black | Black | Black |
| 36 | Black | X | X | X | X | X | X | Black | Black | Black | |

Black X - Rigging can be used on grades up to 25%
 Black O - Rigging can be used on grades up to 17.5%
 Red Rigging cannot be used