Rev. 12/2014

STEPP MFG™

ASPHALT MAINTENANCE EQUIPMENT

OPERATIONS/MAINTENANCE/PARTS MANUAL

Diesel Burner Systems

12325 River Road North Branch MN 55056 ~ Phone: 651-674-4491 ~ Fax: 651-674-4221
www.steppmfg.com

Warranty

Stepp Manufacturing Company Inc. hereby warrants to the original purchaser that products manufactured by Stepp Mfg. will be free from defects in material and workmanship for a period of one (1) year from the date of purchase.

Stepp Mfg., at its discretion, will provide for the repair or replacement of any part found upon examination by Stepp Mfg. to be defective, except as noted below. Such repair or replacement will be free of charge to the original purchaser for a period of one (1) year from the date of purchase, except as noted below.

No warranty is extended to cover:

•Product pump wear or damage caused by foreign objects.
•Routine maintenance, cleaning, and adjustments.
•Parts/components that have been altered, misused, or improperly adjusted or maintained.
•Transportation to and from the place of warranty repair.
•Removal of material from equipment.

The following items are covered solely by their manufactures warranty:

•Engines
•Hydraulic components
•Burners
•Pumps
•Tires
•Other component parts

The following items are covered by a pro-rata warranty:

•Hoses that carry heated materials.
•Heating elements for hoses and wands.

Disclaimer of further warranty:

Stepp Mfg. makes no warranty, expressed or implied, other than this warranty. The implied warranties of merchantability and fitness for particular purpose are hereby disclaimed. Repair or replacement of products or parts proving to be defective in material or workmanship shall be the exclusive remedy for breach of this warranty.
Stepp Mfg shall not be liable for incidental or consequential damages including but not limited to: damages for inconvenience, rental or purchase of replacement equipment, for loss of profits, loss of material, or other loss resulting from breach of this warranty.
Stepp Mfg reserves the right to incorporate any changes in design into its products without obligation to make such changes on products previously manufactured.
Please see Warranty section for more details.

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INTRODUCTION

SRM Recycler

Thank you for selecting *Stepp* highway maintenance equipment. We are confident you will be satisfied with the *Stepp Recycler Mixer. Stepp Manufacturing* is backed by over 70 years of experience in the design and manufacture of highway maintenance equipment. This experience, along with our innovative design and unique features, make the *Stepp Recycler Mixer* an indispensable piece of equipment for your road repairs.

In order to assure safe operation of this equipment, the operator must read and understand all operating procedures and safety notices contained in this manual. In addition, the operator *must* receive instruction on how to safely operate the *Stepp Recycler Mixer.* Contact the manufacturer if any questions arise or if you desire training for additional staff members.

Operating instructions, adjustments, and periodic maintenance procedures are given so you, the operator, can keep your unit working like new and expect many years of dependable service from it. Remember, any machine, regardless of design or type, will perform only in relation to the way it is operated and the maintenance it receives.

Read this manual carefully and observe all warnings and cautions. If you have any recommendations or comments regarding this manual, please send them to: Stepp Manufacturing Co. Inc., 12325 River Road, North Branch MN 55056-6225 or call 651-674-4491. All comments we receive are reviewed and may be incorporated into future manuals.

When ordering parts or making any inquiry about the *Stepp Recycler Mixer,* be sure to include the model and serial number found on the data plate attached to the frame.

WARNING *Do not use the equipment unless the operator has read and understood the operating and safety instructions and has received proper training. Do not operate equipment unless all guards and safety devices are in place and functional.*

WARNING ***Do not exceed safe operating temperature of asphalt or bituminous material.*** *Know the "Flash Point" temperature of the material being used and DO NOT exceed this temperature. The recommended operating temperature information is available from the material manufacturer. Exceeding the recommended temperature may cause equipment damage and serious injury or death.*

Dimensions (approx.)

Length……234 in.
Width……99 in.
Height……Operating 116 in.
Weight……5,350 lbs.

General

Fuel Tank Capacity…… 60 Gallons

Preheat Hopper

Capacity……10 cu.ft.
Opening Dimensions…… …23"x 38"

Loading Conveyor

Belt…… 16" Wide Cleated
Hydraulic Motor……4.0 cu.in. Hydraulic Motor w\ Forward-Reverse

Mixing Chamber

Chamber Type……Continuous Batch Mixing
Mixing Style…… Rotating Pugmill
Liner Type……U-shaped, Replaceable
Combustion Chamber Liner Material……Replaceable ¼" Wear Resistant AR Steel
Insulation Type and Thickness…… 2" Fiberglass & Cerwool, 2" thick
Pugmill Drive, Hyd Motor……5.75:1 Gear Reduction Driven by $^{18}/_{9}$ ci 2 speed

Pugmill:

Pugmill Dimensions……Length 57" x Diameter 27"
Shaft Size……2½" Square
Paddle Size…… Replaceable 4" x 5"
Paddle Material…… Reversible, Replaceable, ¼" Wear Resistant AR Steel
Number of Paddles……24

Mixing Chamber Heating System

Burner Type …… Indirect Diesel, Forced Air
Number of Burners……Two (2)
Fuel Type…… Diesel
Manufacturer……Beckett®
BTU Output……up to 420,000 BTU each - 840,000 BTU Total

CONTINUED ON NEXT PAGE

Kettle Pumping System

Pump Model……Viking HL32®
Relief Valve ……..…….…. WPC Valve
GPM Output Rating……20 gpm
Pump Mounting……..……...Submerged
Pump Drive……..…..Hydraulic, Reversible, Variable Speed with PLC Display

Engine

Manufacture……..……...…. Kubota®
Model……..……..…….. V1505EB
Displacement……..……...……81 cubic inch
Number of Cylinders…..……...…..(4)
Horse Power……..……..……35.1 HP
Fuel Type……..……..……Diesel
Cooling……...……..……..Liquid

Hydraulic System

System Type……...…..Eaton 7000 Series Load Sensing
Pump Displacement……..……...Variable 0 to 1.9 cu.in.
Control type ……...…..Forward/Reverse Flow Control,
Electric Over Manual Operated, Expandable Manifold Cartridge Valve
Hydraulically Powered Hopper Agitator, Hopper Loading Doors,
Sub. Pumping System, and Loading Conveyor
Reservoir Capacity……..……...……30 Gallons
Filtration……..……...……10 Microns

Chassis

Number of Axles……..……..……..Two (2)
Axle Capacity……..……..6000 lbs. each
Tire Size……...……...….225/75R15
Brake Type……..…….Electric Std (Hyd Optional), all 4 wheels
Landing Gear Static Capacity……..……..8,000 lbs each
Screw jack Quantity……...……...……...One (1)
Hitch Type……....3" Pintle Ring or 2 5/16” Ball Type adjustable from 24" to 31"
Frame Material…….....2"x 6"x 3/16” Rectangular Tubing
Lighting……...……...……Approved w/ Breakaway Kit
Recessed Grommeted Lights……Standard

TABLE OF CONTENTS

IMPORTANT NOTICE!
This manual contains cautions and warnings that alert you to potential safety issues.

WARNING *is used to inform you of conditions or operations that could cause serious injury or death.*

CAUTION *is used to inform you of conditions or operations that could cause damage to the equipment.*

NOTE *is used to provide you with additional information that may be helpful or useful for a particular situation.*

Before Starting or Operating this Machine

Understand and observe all the following Warnings, Cautions, and Notes.

WARNINGS

- This equipment contains mechanical and heating components that may cause serious injury or death if not handled or maintained properly. All personnel must be properly trained in the operation and maintenance of this equipment.
- Before refueling, shut off the burners and allow all flames in the burner and pilot light to extinguish. Shut off the engine.
- Check fuel lines, fuel line connections, and all other components for leaks. If any leaks are found, they must be repaired before using the unit.
- Know the temperature required for the material being used, and do not exceed this temperature. Avoid over heating, as this may cause equipment damage, personal injury, and/or death.
- Never load a tank with heated oil when moisture is present in the tank. Depending on the temperature of the hot oil, the moisture may instantly boil causing hot oil to foam up and out of the tank causing severe burns.
- Do not operate the tack tank burner when the amount of material in the tank is less than 4" above the flues. Allow 10 minutes cool-down time after the burner has been shut off before exposing the flues. Exposed flues will over-heat and cause an explosion and/or fire.
- The tack tank cover must be unlatched when operating the tack tank burner. This is to provide for emergency venting, in the event of a flash, to prevent the tank from exploding.

CAUTIONS

- Know the materials being used and know the proper handling, heating, application, clean-up, and storage procedures. Not all materials are compatible with each other. Many materials have a very limited shelf life. Most materials require special handling procedures to prevent personal injury and/or equipment damage. Contact your material supplier and/or manufacturer for proper handling instructions. Equipment malfunction or damage due to improper handling or use of the materials is not covered by warranty.
- Do not exceed the maximum heating temperature or storage time as recommended by the material manufacturer. This may cause emulsion type materials to separate and become difficult or impossible to remove from the machine. Consult with the material manufacturer for recommendations.
- Over-agitation or circulation may cause emulsion type materials to separate and become difficult or impossible to remove from the machine. Consult with the material manufacturer for recommendations.
- Do not mix *Anionic* and *Cationic* materials together, as the materials attach to each other and will become difficult or impossible to remove from the machine. If you are not sure consult your material supplier.

NOTES

- Become familiar with the Material Safety Data Sheet (MSDS) for the material being used in the machine and take appropriate safety precautions. Wear the proper clothing and protective gear as recommended by the MSDS and your safety director.
- DO NOT use the equipment unless it is in good condition.
- In case of skin contact with hot materials, dip into **cool**, **clean water immediately**. Do not wipe the product, as this will spread the burn.
- Consult the MSDS and contact your safety director for proper extinguishing of petroleum based fires.
- Carry a fire extinguisher(s) as recommended by your safety director.
- Notify your supervisor or the manufacturer if any questions arise concerning the operation of this equipment.

OPERATIONS

WARNING: *Before refueling, shut off the burners and the engine.*

CAUTION: *Be sure operators have been properly instructed in starting and operating all equipment before beginning.*

NOTE: *See following pages for specific instructions on operating burners and heating systems.*

Pre-Trip Inspection

1. Check engine fluid levels & grease machine.
2. Check tire pressure.
3. Start conveyor check for wear & tracking.
4. Inspect unit for any physical damage.
5. Check pugmill for broken paddles and excessive wear.
6. Check that discharge door is operating properly.
7. Truck hook-up and lights .

Transporting

Trailer Hook-up

1. Connect trailer to towing vehicle
    a. Assure hitch is engaged properly.
    b. Attach safety chains to towing vehicle.
    c. Connect battery charging circuit to tow vehicle if required. (see illustration below)
    d. Connect electrical plug to towing vehicle.
    e. Connect breakaway cable to towing vehicle.
    f. Check operation of lights and brakes.

2. Secure trailer for transport
    a. Shut OFF the engine and burners.
    b. Shut OFF all fuel valves.
    c. Be sure the product temperature is not above the recommended operating temperature.
    d. Securely latch the tank cover.

WARNING: *Prior to transporting, the driver of the tow vehicle must assure the safety of the operation. The driver must also know, and assure, that the product temperature is within limits.*

Basic Operation

1. Start engine (refer to engine operations).
2. Turn on control box power switch.
3. Load bituminous/asphalt material into kettle using the safety loading chute. **Make sure no moisture is present in tank**. Be sure to wear proper protective clothing. Flues must be completely covered with 4" or more of material to prevent equipment damage or personal injury. Turn burner-oil switch on. The red indicator light on the switch will turn green. Set tack oil SP (set point) thermostat to desired temperature using the up and down buttons on the controller. The tack oil thermostat will display the actual temperature (top reading) and SP (set point), or desired, temperature. Depending on the asphalt materials being used, set temperature to a lower setting to allow temperature to "creep" for initial heat up.
4. When material is hot enough to flow, set valves for circulation and engage product pump in "Pump" position (refer to pumping operations chart located on the rear of the pugmill). Start the loading conveyor.
5. Fill preheat hopper with recyclable asphalt material to a level even with the top edge. Pieces must be small enough to pass through the trap doors. The equipment will provide better performance with smaller pieces. Start conveyor and load hopper with material. **NOTE:** *Check hopper doors. Doors must be closed prior to loading.*
6. Start pugmill burners, front and rear. Switch will turn green when on. **CAUTION:** *Do not use recycler timer for initial pugmill warm up. This could cause residue in hopper to catch fire. If hopper catches fire, dispense load of material into hopper to smother fire, turn the burners off, and allow the machine to cool down before re-firing. Burners will shut off at set point temperature (250 °). Over heating may cause pugmill damage.*
7. Start pugmill mix paddles (2). **NOTE:** *Make sure pugmill paddles are moving freely in both directions, forward and reverse positions.*
8. Engage pugmill mix. Empty contents of the preheat hopper into the recycler mixing chamber using the hydraulic operated trap doors using the door open switch.
9. Set the recycler burner timer for desired heating time by using the up and down buttons next to the timer. The amount of mixing time and heat necessary will be determined through experience. Moisture and material quality varies and will vary the timer setting.
10. Set batch time. **NOTE:** *Set initial batch time for 10 minutes. Normal batch times may vary from anywhere between 8-16 minutes, with the first batch of the day taking longer due to heating the machine up.* Press the "Cycle Start" button to start the batch timer and activate the burners to the pugmill set point. If more time is needed, adjust time accordingly. Operator will need to dispense a small amount of material to test the temperature with a hand held infrared scanner. Burners will fire to the high level set point until additional time has elapsed. When burners are firing, watch the top stack for moisture dissipating. Batch will be very close to temperature once the steam has stopped and you are getting a clean exhaust. If exhaust starts to smoke or turn blue, the material is overheated or very close to being overheated. If blue smoke is present turn burner switches off and discharge material. **CAUTION:** *Discharge material at 320-350°. If material is at temperature before time is done, shut off the burner.*
11. Adjust the damper on the exhaust stack according to heating needs. Closing the damper will retain more heat in the recycler's mixing chamber. Opening the damper will allow raw aggregate to dry quicker.

12. If necessary, add heated bituminous binding material to the recycler mixing chamber (refer to the plumbing operations chart). Here again, experience is the best indicator of how much to add. Start with $^{1}/_{2}$-$1^{1}/_{2}$ gallons of oil. Know the material being added and the flash point. We recommend that you use an AC type oil and add the oil in the first three minutes of the batch timer. The pump has an oil counter so you can meter the amount of material added. With the pump running in the "forward" position, move valve **#2** to the "Mixer" position. The pump will run until the pre-set amount is reached. At that point, the pump will stop and the attention light will flash until valve **#3** is returned to "Recirculate" position.
13. Reload preheat hopper while you wait for the mixing action to be completed. This will allow for the next batch to be preheated, resulting in faster batch times.
14. Set the toggle switch to discharge in order to empty the mixed material onto the shovel platform for easy shoveling. Swinging the shovel platform up out of the way will allow the mixed material to empty directly on the ground. The switch has two settings: green for slow discharge, yellow for higher speed discharge. To engage high speed, press discharge twice.
15. Reload the next batch. Press "Cycle Start" button in order to start the next batch.
16. To shut down the machine shut off all burner switches. Empty the recycler mixing chamber.

WARNING: *All flames (burners and pilot lights) must be extinguished before flushing operations begin to reduce the chance of fire and/or personal injury.*

17. Flush the pump, wand, and plumbing to prevent a plugged system (refer to the plumbing operations chart). **NOTE:** *Running a load of coarse rock through the unit will help remove asphalt deposits.*
18. Shut off the engine.

NOTES:

- *Operator must have infrared heat gun to operate machine.*
- *Check "Set Points" on control panel.*
- *Never have burners on without material in pugmill, unless you are doing start up.*
- *Check material temperature at 8 minutes. Material temperatures will climb quickly once moisture is out of material. Check every minute or two after that.*
- *Normal batch times vary from 6-18 minutes depending on moisture and material quality.*
- *Initial batch could take 2x's longer, due to initial heat up of machine.*
- *1/2-1 1/2 gallons of oil additive is average for material.*
- *Allow cooling at end of the day. (Open hopper doors and run pugmill for 10 minutes in discharge.)*

Helpful Tips to Making Quality Recycled Materials

1. **Have your millings tested for asphalt content.** This will help you decide how much additive you need. The average ton of asphalt top mix has 5-7% oil by weight. This translates into 100-125 pounds of asphalt added to virgin aggregate to make top mix. PG grade asphalts are approximately 7.5 pounds per gallon. So if you convert that to gallons there is approx. 13.3 gallons of asphalt in 100 pounds to make 1 ton of mix. 100/7.5= 13.3333. Most millings need 1/2-1% of new oil to give you a quality patch material. The SRM makes approximately a 1000 pound batch, so on average you need to add 1/2 gallon to 1 1/2 gallon or 3.75 pounds to 11.25 pounds of asphalt additive to make a quality mix.

2. **Recycled materials have huge variables.** Different asphalt contents, different moisture contents, different aggregates, base material containments, and different size aggregates will all vary the batch times and material quality. Making your first batches in your SRM will take some experimenting. You will need to find the right recipe. Start with shorter batch times and check your material often on the first batch or two. Start with a little oil and add more as you need it. Once you come up with your recipe for the materials that you are using you should see consistent results. The next batches will be very similar and you should only have to make minor adjustments.

3. **Keep materials dry.** Moisture content is the number one cause for slow batch times. If you can, keep your millings inside or covered. It takes more BTU to dissipate a gallon of water than it does to melt a gallon of asphalt. Moisture acts as a refractory in the material and can not be dispersed until turned to a gas (steam). High moisture content can double or triple batch times, so having dry millings is key to higher production.

4. **Quality of materials.** Using quality materials also aids in faster batch times. Materials with large aggregates take longer to drive the heat into the stone. Contaminated materials with base also take longer to heat because of lack of oil in the materials. Materials with higher asphalt contents also heat up faster. The SRM does not care, it just may affect the heat up times.

5. **The SRM is capable of making materials from virgin aggregates.** You can make virgin materials with the SRM, you just need more oil. Using the reference above, in #1, you can make your own custom mixes. Sand mixes, fine mixes, and mixes from virgin materials. Again, you will need to do some experimenting to get the right mix design. If making virgin mix, use the 5-7% to get you started (5-7gallons). Always start with a smaller amount of oil; you can always add more oil, but you can't take it away. Different oils will also give you different results in materials.

6. **Pre-made cold mix materials.** You can use your SRM to warm your cold mix materials. Use extreme caution when doing so. Most cold patch materials have a high content of cutter (solvent) in the oil. This makes the material soft and pliable, but also makes them very easy to catch on fire. If you are using the SRM to heat cold patch material, only fire the burner in 1-2 minute cycles and check the temperature very often to prevent the material from flashing.

WARNING: *The burners must be shut off when the product reaches a level approximately 4" above the flues. Exposed flues will overheat causing an explosion in the tank. This will cause equipment damage and possible injury or death to personnel.*

Before Igniting the Burner:

1. Know the materials being used. DO NOT exceed flash point or operating range temperatures.
2. Ensure the kettle is level and the heating flues are completely immersed in product to prevent damage to equipment or personal injury.
3. The kettle cover must be unlatched to provide emergency venting in event of a flash.
4. Vent the kettle by opening the cover for five minutes prior to firing.
5. Load bituminous/asphalt material into kettle using the safety loading chute. **CAUTION:** *Make sure that no moisture is present in tank and make sure to wear proper protective clothing.* Turn *"burner-oil"* switch on. When material is hot enough to flow, set valves for circulation and engage product pump in "Pump" position (refer to pumping operations chart located on the rear of the pugmill).

WARNING: *Failure to observe these instructions may cause damage to the equipment, personnel injury, or death.*

Igniting the Burner:

1. Verify heating flues are completely covered with a minimum 4" of product.
2. Verify proper heating temperature, and set the SP (set point) thermostat to that temperature.
3. Turn oil burner power switch ON and burner will ignite; a small flame indicator will appear. The red indicator light on the switch will turn green. Set *"tack oil SP"* (set point) thermostat to desired temperature using the up and down buttons on the controller. Tack oil thermostat will display actual temperature (top reading) and SP (set point), or desired, temperature. Depending on asphalt materials used, set temperature to a lower setting to allow temperature to "creep" for initial heat up.
4. Monitor product level in kettle and shut burner OFF when oil level is 4" above heating flues.

NOTE: *If the "Lockout" message appears on the screen, it indicates a malfunction of the burner. Verify fuel supply to the burner (proper fuel and no air bubbles in system) then reset the burner by setting power switch OFF then ON. If problem persists, consult a service technician. DO NOT reset burner more than two times, as excess fuel may accumulate in combustion chamber creating a fire hazard.*

Shutting off the Burner:

1. Set thermostat to the lowest setting and allow a one minute cooling period.
2. Turn OFF burner oil switch on the control box.
3. Close and latch kettle cover.
4. Turn main power switch OFF.

WARNING: *It is the operators responsibility to set the proper temperature on the thermostats as required for the operation.*

Before Igniting the Burner:

1. Know the materials being used. DO NOT exceed flash point or operating range temperatures.

Igniting the Burner:

1. The SRM recycler chamber has two set point temperatures. One "higher firing" set point for heating up the mix, and one "stand-by" temperature setting that keeps the liner and materials at a given temperature. Pressing the *"Cycle Start"* button changes the max set point to the "higher firing" set point. These set points are set at 750°F for the "higher firing" set point, and 250°F for the "stand-by" set point. Both of these are adjustable from the set-up screen, which is accessed by pressing the ADJUST MILL SET POINT button located on the upper right hand of the display. The temperatures displayed on the screen are the temperature readings of the pugmil liner, not the material temperature.
2. Turn ON front, rear, or both recycler burner power switch(s) as desired and burner(s) will ignite and a flame indicator will appear next to the front or rear on the recycler chamber display. The burner will fire until the standby temperature is reached. The switch will turn green when on. **CAUTION:** *Do not use recycler timer for initial pugmill warm up. This could cause residue in hopper to catch fire.* ***If hopper catches fire, dispense load of material into hopper to smother fire, turn the burners off, and allow the machine to cool down before re-firing.*** *Burner's will shut off at set point temperature (250°). Overheating may cause pugmill damage.*
3. Set batch time. **NOTE:** *Set initial batch time for 10 minutes. Normal batch times may vary from anywhere between 8-16 minutes, with the first batch of the day taking longer due to heating the machine up.* Press the "Cycle Start" button to start the batch timer and activate the burners to the pugmill set point. If more time is needed, adjust time accordingly. Operator will need to dispense a small amount of material to test the temperature with a hand held infrared scanner. Burners will fire to the high level set point until additional time has elapsed. When burners are firing, watch the top stack for moisture dissipating. Batch will be very close to temperature once the steam has stopped and you are getting a clean exhaust. If exhaust starts to smoke or turn blue, the material is overheated or very close to being overheated. If blue smoke is present turn burner switches off and discharge material. **CAUTION:** *Discharge material at 320-350°. If material is at temperature before time is done, shut off the burner.*

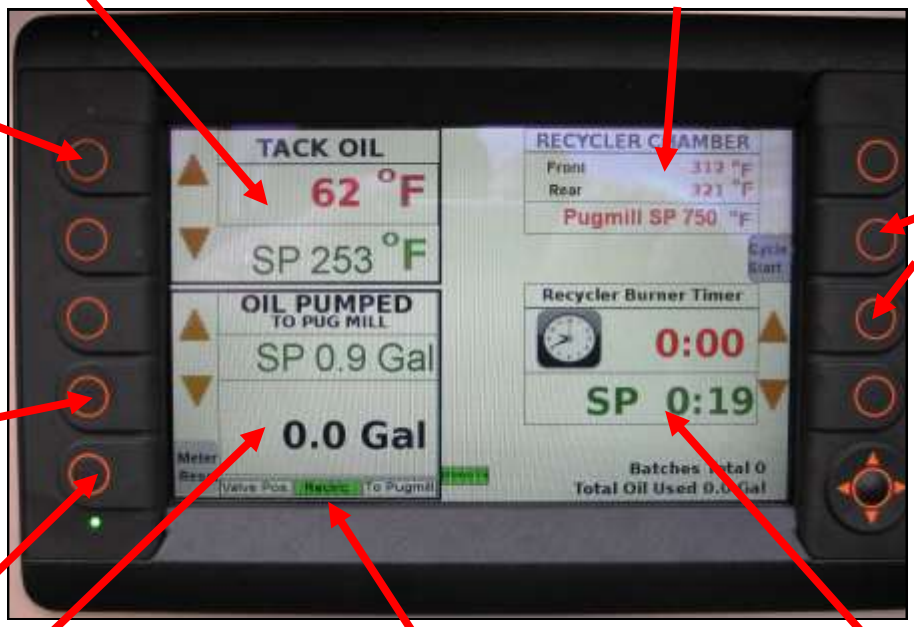
NOTE: *If the "Lockout" message appears on the screen, it indicates a malfunction of the burner. Verify fuel supply to the burner (proper fuel and no air bubbles in system) then reset the burner by setting power switch OFF then ON. If problem persists consult a service technician. Do not reset burner more than 2 times as excess fuel may accumulate in combustion chamber creating a fire hazard.*

Shutting off the Burner:

1. Turn OFF power switch(s) on the control box.

Tack Oil: Shows SP (set point) and actual temperature of oil kettle.

Recycler Chamber: Shows temperature of the recycler/mixing chamber. Does not show indicated material temperature.



Tack Oil SP (set point) Temperature Adjustment

Cycle Start: Resets the batch timer.

Burner Timer Adjustment: Top display batch time will not restart without pressing the cycle start button.

Oil Pumped SP (set point) Gallon Adjustment

Meter Reset: Resets the oil pumped to zero

Valve Position: Refers to #3 recirc/mixer valve located above control box.

Oil Pumped: Displays actual gallons pumped and SP (set point), or desired, gallons pumped. 1/10 gallon increments.

Burner Timer: Top display batch time will not restart without pressing the cycle start button

All PLC Switching are latching switches. Press once to turn on and press second time to turn off. When switch is activated it will turn from red to green.

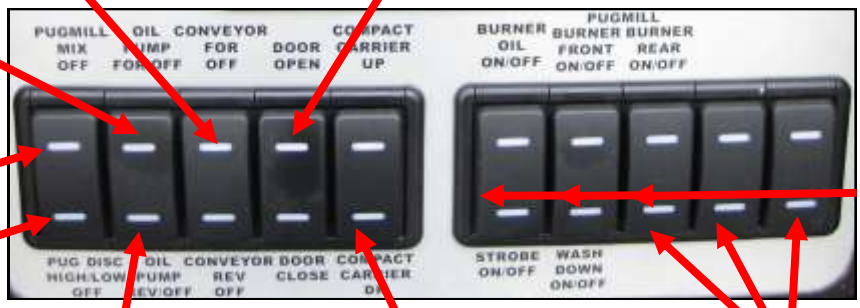
Conveyor Forward/ Reverse

Top Door Open/Close: Opens trap door

Oil Pump Forward

Pugmill Mix: Press once for activating mixer. Indicator will turn green when on.

Pugmill Discharge: Press once for discharge and twice for high speed discharge.



Burner Controls: Turns on oil burner, front and rear pugmill burners.

Oil Pump Reverse

Compactor Plate Carrier up/down

Optional Equipment

Engine Starting

WARNING: *Be sure all pre-start checks are complete prior to starting engine.*

The SRM is equipped with a digital engine management system. This system will shut the engine down in case of an engine overheat or low oil pressure. It is also equipped with an hour meter, cold weather glow plug button, and a starting button.

1. Fill fuel tank.
2. Turn “Key Switch” clockwise to the “Start” position.
3. Press and hold Yellow glow plug button for 30-90 seconds.
4. Press Green button to start.
5. If engine does not start on first try, you must turn the “Key Switch” OFF and restart the starting sequence.
6. To shut engine down turn “Key Switch” counterclockwise.

NOTE: *If engine will not turn over, check the emergency shutdown button located on the operators control box.*

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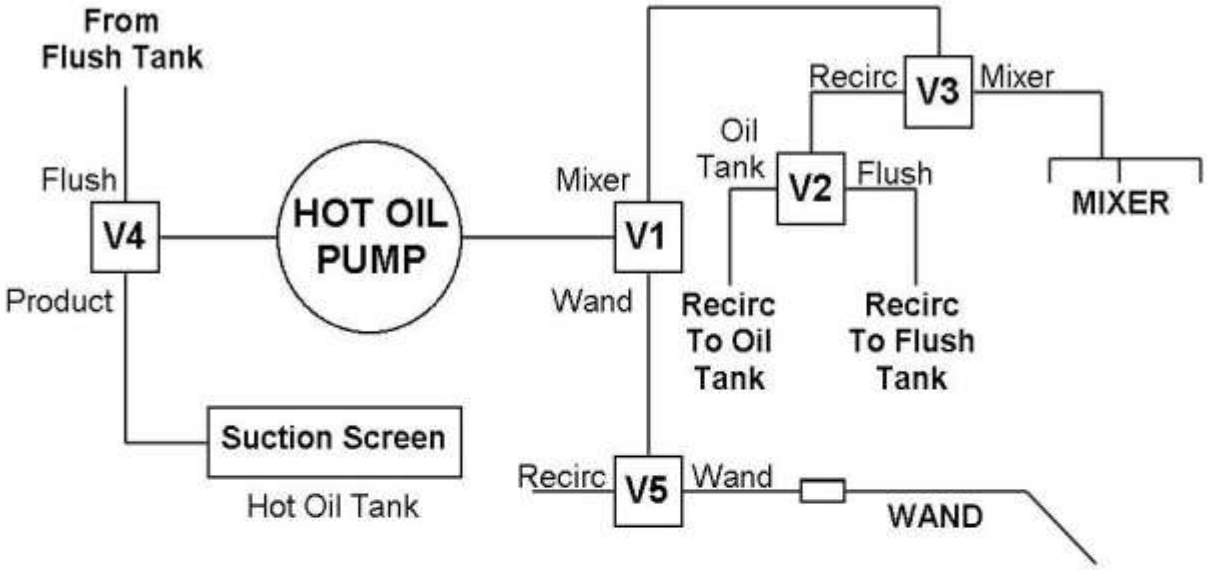
ASPHALT RECYCLER HOT OIL OP CHART



OPERATION	Valve 1	Valve 2	Valve 3	Valve 4	Valve 5	Pump Switch
Recirculate Back to Tank	Mixer	Oil Tank	Recirc	Product	Recirc	Forward
Pump Wand	Wand	Oil Tank	Recirc	Product	Wand WPC	Forward
Pump to Mixer	Mixer	Oil Tank	Mixer	Product	Recirc	Forward
Suckback Mixer Plumbing	Mixer	Oil Tank	Recirc/Mixer	Product	Recirc	Reverse
Suckback Wand	Wand	Oil Tank	Recirc	Product	Wand	Reverse
Flush Plumbing	Mixer	Flush	Recirc	Flush	Recirc	Forward
Flush Wand	Wand	Flush	Recirc	Flush	Wand	Forward

WARNING!!

DO NOT allow flushing solvent to enter the hot oil tank or mixer.
DO NOT allow the hot oil tank burner to operate with the product level less than 2 inches above the flues. Severe damage to equipment and possible serious injury will result.

WPC - Wand Pressure Control Valve

WARNING:

DO NOT allow flushing solvent to enter hot oil tank or mixer.
DO NOT allow the hot oil tank burner to operate with the product level less than 2 inches above the flues. Severe damage to equipment and possible serious injury will result!
DO NOT flush through a heated wand.

HOT OIL PUMPING SYSTEM
10-120 RECYCLER

Valve V1: Mixer / Wand
Valve V2: Flush / Oil Tank (Recirculate)
Valve V3: Mixer / Recirc (Recirculate)
Valve V4: Product / Flush
Valve V5: Wand / Recirc (Recirculate)

Mixer: This is the recycler mixing chamber, where asphalt is heated/mixed and product is added.
Wand: This is the spray wand from which tack coat can be sprayed.
Flush: This refers to the solvent tank where solvent is kept to clean out the hoses.
Recirc: This refers to the recirculated material within the system.
Product: This refers to the kettle tank or Product in the kettle tank where the tack coat is melted.

Valve Positions Required for Various Valve Functions:

WARNING: Before adjusting valves, shut off the pump to the neutral position.

1) Pump Wand: Move liquid from Product tank to spray wand.
- **A) V1 - Wand**
- **B) V2 - Oil Tank**
- **C) V3 - Recirc**
- **D) V4 - Product**
- **E) V5 - Wand / WPC (Wand Pressure Control)**
  - i) **WARNING!!!** When wand is shutoff, DO NOT move valve **V5** fully to **Wand**. Doing so will cause excessive pressure build up: causing a loud high pitch tone from the hydraulic system, risking hose rupture and high pressure at the spray wand head.
  - ii) Move valve **V5** toward **Recirc** to reduce spray pressure. This will control the pressure of the Product being sprayed.
- **F) Control Panel:** Set **'Hot Oil'** switch to **'Forward'**

2) Pump/Product to Mixer: Pump Product from Product Tank to Mixer.
- **A) V1 - Mixer**
- **B) V2 - Oil Tank**
- **C) V3 - Mixer:** Adjusting this valve to **Mixer** Directs flows to Mixer. Adjusting this valve to **Recirc** directs flow away from Mixer.
- **D) Control Panel:** Turn **'Hot Oil'** switch to **'Neutral'**
- **E) Control Panel:** Push RST (Reset Button on the Red Lion Controller, which sets counter to 0 (Zero)
- **F) Control Panel:** Turn **'Hot Oil'** switch to **'Forward'**
- **G) Control Panel:** The Red Lion Controller will show you how much product is being added to the Mixer.
  - i) When the desired amount of product has entered Mixer, turn **V3** to **Recirc** to stop product flow to the mixing chamber and return product to the tank.
- **H) V4 - Product**
- **I) V5 - Recirc**

3) Recirculate Back to Tank: Circulate product through plumbing to prevent Product build up in plumbing lines.
- **A) V1 - Mixer**
- **B) V2 - Oil Tank**
- **C) V3 - Recirc**
- **D) V4 - Product**
- **E) V5 - Recirc**
- **F) Control Panel:** Set **'Hot Oil'** switch to **'Forward'**

SYSTEM CLEANOUT PROCEDURES

4) Suckback Wand
- **A) V1 - Wand**
- **B) V2 - Oil Tank**
- **C) V3 - Recirc**
- **D) V4 - Product**
- **E) V5 - Wand**
- **F) Control Panel:** Set **'Hot Oil'** switch to **'Reverse'**
- **G) WARNING:** Emptying lines of Product must be done before flushing system with solvent.

5) Suckback Mixer Plumbing:
- **A) V1 - Mixer**
- **B) V2 - Oil Tank**
- **C) V3 - Recirc**
- **D) V4 - Product**
- **E) V5 - Recirc**
- **F) Control Panel:** Set **'Hot Oil'** switch to **'Reverse'**
- **G) WARNING:** Emptying lines of Product must be done before flushing system with solvent.

WARNING: Emptying lines of Product must be done before flushing system with solvent.

6) Flush Plumbing
- **A) Set valves before starting pump.**
- **B) V1 - Mixer**
- **C) V2 - Flush**
- **D) V3 - Recirc**
  - i) **WARNING:** Never turn **V3** to **Mixer** when flushing as this will direct solvent flow to Mixer and may cause a fire or explosion.
- **E) V4 - Flush**
- **F) V5 - Recirc**
- **G) Control Panel:** Set **'Hot Oil'** switch to **'Forward'**
- **H) Circulate flush solvent through plumbing:** Flush and circulate solvent through plumbing.

7) Flush Wand
- **A) Set valves before starting pump.**
- **B) V1 - Wand**
- **C) V2 - Flush**
- **D) V3 - Recirc**
- **E) V4 - Flush**
- **F) V5 - Wand**
- **G) Control Panel:** Set **'Hot Oil'** switch to **'Forward'**
- **H) Circulate flush solvent through wand:** Flush and circulate solvent through wand.

T10009432

Hand Wand

Wand Pressure Control Valve
(WPC Valve)

Operators must understand the proper operation of the WPC valve located on the top rear of the unit. The purpose of this valve is to direct the flow of product either back to the tank (during start-up to assist melting) or to the wand (during crack filling or pothole spraying operations).

Because of the properties of asphalt, no automatic relief valve is installed in the system. Therefore, the operator must adjust the WPC valve to a position midway between the valve stops. This will allow product to flow to the wand and also back to the tank at the same time, preventing excessive pressure from building up in the hose and wand.

Positioning of the WPC valve towards "Recirculate" will cause less flow and less pressure to the wand. Positioning of the WPC valve towards "Wand" will cause more flow and more pressure to the wand.

The WPC valve should never be positioned fully to the “Wand” position, unless the wand control valve located on the wand is fully open, or for flushing operations to ensure that flush solvent will not enter the tank. Excess flow and pressure to the wand may cause damage to the hose and system, and possibly result in personal injury.

Observing unusual flexing in the wand hose should alert the operator that excess pressure is being applied to the wand hose. Considering factors such as temperature of product, desired amount of flow and varied operating conditions will assist the operator in selecting the proper position of the WPC valve. The WPC valve must be left in the “Recirculate” position when the unit is shut down.

CAUTION: *The WPC valve should never be positioned fully to the “Wand” position, unless the wand control valve located on the wand is fully open, or for flushing operations to ensure that flush solvent will not enter the tank. Excess flow and pressure to the wand may cause damage to the hose and system, and possibly result in personal injury.*

Heated Hose & Wand (optional)

The application hose and wand are equipped with internal heating elements. The elements are powered by the 24 volt alternator run by the engine. This heating element prevents the product from freezing in the hose and wand. The electric wand heat control should be turned on 20 to 30 minutes before trying to pump material through the hose and wand. This will allow time for the material to re-liquefy in the hose.

It is recommended that you circulate the product back to the tank through the wand circulating flange provided in the hood. This is to assure proper flow and temperature of the material going though the wand. Depending upon the volume of the material going through the wand and the outside temperature, it may not be necessary to run the heated wand all the time. Once flow is established through the wand and circulating back to tank, it is recommended that the electric heating element be used only as required to maintain flow. This will help to extend the life of the heating elements. If the flow is not adequate to maintain temperature in the hose and wand, freeze up may occur. If this happens, simply turn the electric heating element on, and allow time for the material to re-melt. No clean up is required with the electric wand; just shut the machine off as the product can be re-melted by activating the *Wand Heat Control*. No additional flushing is required.

CAUTION: *Do not activate the Electric Wand Heat unless the hose and wand have product in them. Absence of product will cause the element to overheat and destroy the hose, possibly causing serious injury.*

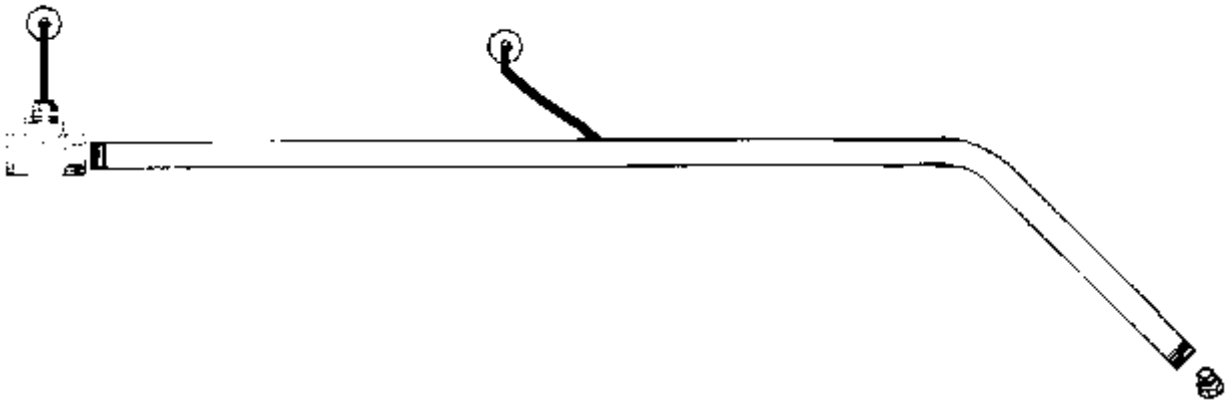
Overnight Heater (optional)

This feature will decrease start up time by maintaining the product from 150° to 200° F, depending on ambient temperature. The system consists of a heating element submerged in the product. Set the thermostat to the desired temperature and plug the heater in. The heater requires 110V, 15 AMP service. The extension cord used must be the outdoor heavy duty type, grounded, and rated for 1500 watt service.

CAUTION: *If overnight heaters are used, make sure to vent the kettle by opening the cover for five minutes before firing the diesel burner. Failure to do so may result in a FLASH of the asphalt vapors*.

NOTE: *The heater is screwed into the rear of the kettle. To install a heater, or to replace A heater, follow these steps:*

1. Be sure all the asphalt product is drained from the tank. The tank may need to be heated and then drained if it contains frozen asphalt.
2. When the unit has cooled to ambient temperature remove the heater and replace with the new heater.
3. Replace cord if needed.



Application with Twist-Valve Wand

1. Position the WPC valve midway between the wand and recirculate position.
2. Close the wand flow control valve (located on the wand handle) and remove wand from the recirculating flange.
3. Set product pump to "Pump" position, then open the wand flow control valve to apply product to the road surface.
4. Adjust the WPC valve as necessary, being careful not to over pressurize the wand and hose assembly.
5. Monitor the level in the tank and add product as necessary.

WARNING: *The Stepp SRM requires special shut down procedures that must be followed to maximize safety and equipment performance. The procedures will assure that the hose and wand always have product in them to avoid an over-heated element. (**Do Not** suck the product back out of the wand and hose assembly) No hose cleanup is necessary as the product in the hose is re-melted at the next start up with the wand and hose heating element.*

Standard Shutdown Procedures for Units With Heated Hose

1. Turn OFF the wand heat control switch.
2. Move the WPC valve to the "Recirculate" position.
3. Turn oil pump switch to reverse position for two minutes, then turn oil pump switch to off. This will draw the product out of the pump, plumbing, and WPC valve.
4. Reduce engine RPM and allow to run at idle for a minimum of two minutes.
5. Shut OFF the engine.
6. Securely latch all covers.

CAUTION: *Do not reverse the pump with the WPC valve in the "Wand" position as this would suck the product out of the wand and hose assembly. The hose and wand must contain product to absorb the heat from the heating elements to avoid equipment damage. Only reverse the pump when the WPC valve is in the "Re-circulate" position. No hose cleanup is necessary with this system.*

Standard Shut Down Procedures for Units With Non-Heated Hose

WARNING: *The Stepp SRM requires special shut down procedures that must be followed to maximize safety and equipment performance.*

CAUTION: *Set pump to OFF or neutral before adjusting valves.*

1. Turn oil pump switch to OFF position. Red indicator light will come on.
2. Move the WPC valve to the "Wand" position and open the wand handle.
3. Turn oil pump switch to reverse position for two minutes, then turn oil pump switch to OFF. This will draw the product out of the pump, wand, plumbing, and WPC valve.
4. Set valves to flush system according to the pump chart.
5. Set WPC valve to “Full Wand” position. Failure to set this in “Full Wand” position will allow flushing solvent to enter the product tank. Insert wand into the recirculating flush tank to recover flush solvent. Turn oil pump switch to “Pump/Forward” position and flush the plumbing thoroughly for 2-3 minutes.
6. Turn oil pump switch to “Neutral/Off” position.
7. Move the WPC valve to the "Wand" position and open the wand handle.
8. Turn oil pump switch to “Reverse” position for two minutes, then turn oil pump switch to OFF. This will draw the product out of the pump, wand, plumbing, and WPC valve. This will return the flush solvent to the flush tank. Operators may choose to leave the flushing solvent in the lines overnight to assure that the lines are clean. Operator must follow the suck back flush solvent before changing valves to spray asphalt or you may contaminate the product tank with flushing solvent.
9. Reduce engine RPM and allow to run at idle for a minimum of two minutes.
10. Shut OFF the engine.
11. Securely latch all covers.

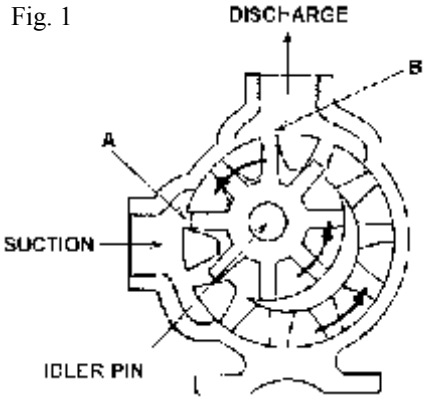
NOTE: *All plumbing operations that were used must be flushed or lines will be frozen with asphalt. Refer to the pump operations chart.*

1. **It is recommended that the product be drawn down to $^{1}/_{4}$ capacity or less prior to shutdown.** This will decrease the start up time the next time the machine is used. However if you are *certain* the equipment will be used the next day (no chance of rain, etc.), leave the unit about ½ to ¾ full, then plug in the optional overnight heaters. This will help retain heat for a faster start up the following day.
2. **Do not heat or reheat any product for a length of time more than that recommended by the product manufacture.** This is typically 16 hours or two heating cycles. Check with your product manufacture for recommendations specific to your material.
3. **The valve at the end of the wand is not heated by the heating element.** Although heat transfer from the wand will normally be enough, by inserting the wand into the recirculating flange, additional heat from the kettle will aid in heating the valve.
4. **Overnight heating elements normally should not be used for more than 48 hours.** Check the product manufacturers recommendations for the material's maximum "pot life". The overnight heater will maintain approximately 200º F after temperatures have stabilized.
5. **If the engine quits for any reason, move the WPC valve to the recirculate position, then attempt to resolve the problem and restart the engine as soon as possible.** The proper shut down procedures must be followed before the product hardens in the exterior plumbing. If the product hardens in exterior plumbing, use heat to re-liquefy the product to re-establish flow.
6. **Avoid excessive pulling, bending, and twisting of the wand hose.** This may cause the service life of the hose and heating elements to be greatly reduced.

MAINTENANCE

The pump used for hot oil pumping is a gear type pump. Shaft rotation will determine which port is suction and which is discharge. A look at the Fig.1 will show how the fluid will flow through the pump. As the gears come out of mesh (A), liquid is drawn into the suction port. As the gears come into mesh (B), the liquid is forced out the discharge port. Reversing the rotation reverses the flow through the pump.

Fig. 1



NOTE: *An easy way to determine which port is suction or discharge is to note the shaft rotation and remember that the fluid takes the "long way" around the pump to get from the suction port to the discharge port.*

NOTE: *The idler pin, which is offset on the pump head, should be positioned toward, and an equal distance, between the suction and discharge ports.*

End Clearance Adjustment

The head to rotor clearances (B, in Fig.1) should be checked every 100 hours of operation or when pump performance decreases noticeably. If adjustment is necessary the pump will need to be disassembled.

1. Measure end clearance by moving pump shaft in and out, clearance should be .005" to .007"
2. Clearances are adjusted by adding or removing head gaskets (C) of various thicknesses.

NOTE: *Be careful not to adjust clearances too tight as the pump may "bind" at high operating temperatures due to expansion.*

Packing Adjustment

The pump shaft packing should be adjusted after the first 50 hours of operation, then every 100 hours or when leakage increases noticeably. Note: A "small" amount of leakage is required to lubricate the packing. The pump DOES NOT need to be disassembled for this adjustment.

1. Tighten the 2 packing gland nuts (A) equally, 1/4 turn at a time, to decrease excess leakage.

NOTE: *A small amount of leakage is required to lubricate the packing.*

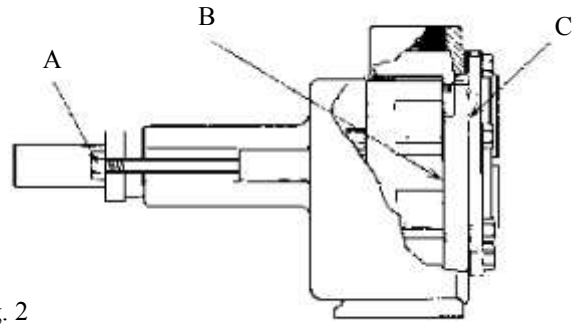


Fig. 2

Hot Asphalt Hose Replacement

CAUTION: *Do not remove hose without first removing the heating element or damage to heating element will result.*

Hose Removal:

1. Remove heating element from hose (refer to heating element removal procedures).
2. Disconnect all electrical connections from hose.
3. Separate the hose from the wand at the quick coupling.
4. Remove the quick coupling from the hose and save for reuse on the new hose.
5. Unscrew the hose from the cross fitting at the end of the boom assembly.
6. Gently pull the hose off the unit, being careful not to damage the heating element.

Hose Installation:

1. Screw the hose fitting into the cross fitting at the end of the boom assembly and tighten securely.
2. Screw the quick coupling to the other end of the hose and tighten securely.
3. Reconnect all electrical connections to hose.
4. Reinstall heating element into hose, but do not reconnect electrical connector at this time.
   NOTE: *The heating element will protrude about 10" from the end of the hose.*
5. Gently heat the end of the wand with a propane torch. This will soften the material in the wand for easy insertion of the protruding hose heating element (see next step).
6. Connect the hose to the wand at the quick coupling. Use gentle pressure to insert the protruding hose heating element into the wand. **CAUTION:** *Do not apply power to the hose heating element in an empty hose or damage to the hose will result.*
7. Bring material in tank up to operating temperature (refer to operating instructions).
8. Verify hose heating element is disconnected.
9. Activate wand and boom heat for 20 minutes.
10. Pump material through wand until flowing freely (refer to operating instructions).
11. Stop pump. Connect hose heating element connector. The hose is now full of material and the unit can be returned to service.

Hose Heating Element Replacement
(Functioning Element)

Hose Heating Element Removal:

These instructions assume the heating element is functioning properly. If the heating element does not function, refer to the instructions on the following pages.

NOTE: *If the hose is damaged, skip steps 1 through 3, activate wand heat for 15 minutes, then begin at step 4.*

1. Start the engine and the burner and allow the product to reach operating temperature. Activate wand heat switch. Begin circulation of material through the wand into the recirculating flange when temperatures permit. When product is circulating freely proceed to step two.
2. Turn OFF the electric wand heat. Then with wand valve open, and the wand pressure control valve in the "Wand" position, reverse the pump for two minutes to clear the hose, wand, and boom of material.
3. Shut OFF the burner and the engine.
4. Disconnect the hose heating element connector at the end of the boom.

NOTE: *The following steps must be accomplished with all components warm.*

5. Remove the compression fitting that holds the hose heating element at the top of the *cross* fitting on the end of the boom.
6. Gently pull the heating element from the *cross* fitting and the hose.

WARNING: *The heating element will be HOT, wear protective clothing, leather welding gloves, and safety gear.*

CAUTION: *Do not pull on the wires to remove the heating element or damage to the element may result.*

Hose Heating Element Replacement
(Functioning Element)

Hose Heating Element Installation:

1. Remove wand from hose at quick coupling.
2. Lay the hose out as straight as possible.
3. Install new compression fitting into cross fitting.

NOTE: *If hose DOES NOT contain material proceed with step 4. If hose CONTAINS material, replace step 4 with steps A & B listed below.*

4. Insert heating element into compression fitting and hose. About 10" of the heating element will protrude out the other end of the hose. Tighten compression fitting.
5. Insert protruding element into wand and reattach wand to hose at quick coupling. (Gently heat wand with propane torch to ease installation if needed.)
6. Reconnect all electrical connections.

CAUTION: *Do not apply power the hose heating element in an empty hose or damage to the hose will result.*

7. Bring material in tank up to operating temperature. (refer to operating instructions) and activate wand heat.
8. Pump material through wand until flowing freely. (refer to operating instructions) The hose is now full of material and the unit can be returned to service.

Steps A & B

A. Connect one lead of the heating element to the large terminal of the 24V alternator, and the other lead to a good chassis ground. Use 10 gage (minimum) jumper wires.

B. Start the engine, as the heating element heats, insert it into the hose. Start and stop the engine, or disconnect the jumper wires, as needed to regulate the heat of the element. Use only enough heat to soften the material and allow the element to be pushed into the hose. (About 10" of the heating element will protrude out the other end of the hose) Tighten compression fitting.

Proceed to step 5 above.

WARNING: *The heating element will be HOT; wear protective clothing, leather welding gloves, and safety gear.*

Hose Heating Element Replacement

(Non-Functioning Element)

Hose Heating Element Removal and Installation:

These instructions assume the heating element is damaged and NOT functioning. If the heating element functions properly, refer to the instructions on the previous page. The element may be damaged during removal, rendering it useless.

A functioning hose heating element is slid into the hose alongside the non-functioning element. As the material in the hose is heated with the new element, the old element can be pulled from the hose.

1. Remove wand from hose at quick coupling. About 10" of the hose heating element protrudes out of the hose and into the wand. Gently heat wand with propane torch to ease separation if needed.
2. Disconnect the hose heating element connector at the end of the boom.
3. Remove the compression fitting nut that holds the hose heating element at the top of the cross fitting on the end of the boom. Then, remove the complete compression fitting.
4. Pull the element out and to the side far enough to allow a new element to be slid in alongside the old element.
5. Connect one lead of the new element to the large terminal of the 24V alternator, and the other lead to a good chassis ground. Use 10 gage (minimum) jumper wires.
6. Start the engine, as the heating element heats, insert it into the hose along side the old element. Start and stop the engine, or disconnect the jumper wires, as needed to regulate the heat of the element. Use only enough heat to soften the material and allow the element to be pushed into the hose.
7. Pull the old heating element from the cross fitting and the hose.
8. Secure new heating element in compression fitting, then reconnect electrical connector.
9. Insert protruding hose element into wand and reattach wand to hose at quick coupling. (Gently heat wand with propane torch to ease installation if needed.)

WARNING: *The heating element will be HOT, wear protective clothing, leather welding gloves, and safety gear.*

Wand & Boom Heating Element Replacement

Wand or Boom Heating Element Removal and Installation:

These instructions assume the heating element is damaged and not functioning. The element may be damaged during removal rendering it useless.

A functioning heating element is slid into the wand or boom along side the non-functioning element. As the material is heated with the new element, the old element can be pulled from the wand or boom.

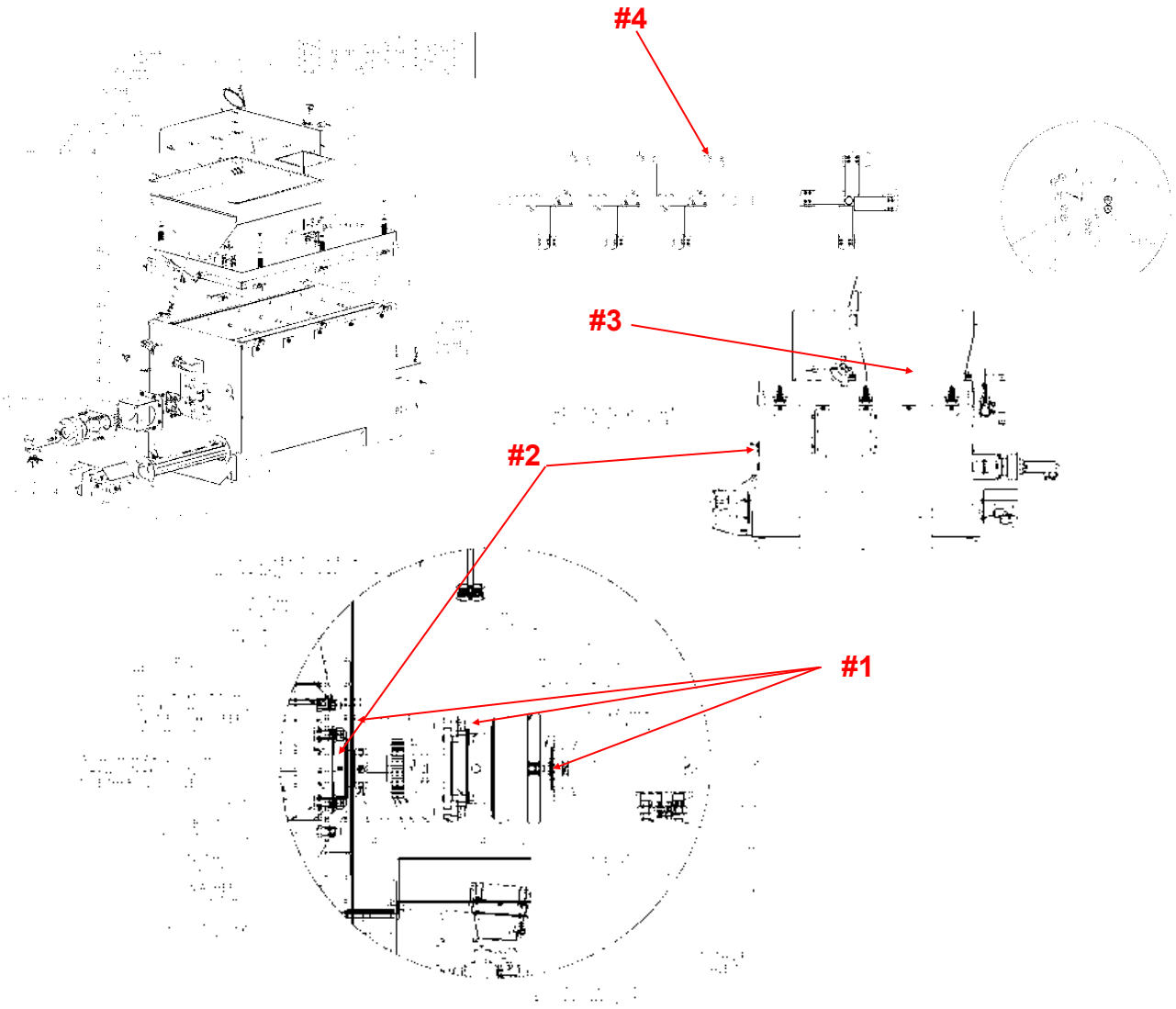
1. Remove wand from hose at quick coupling. About 10" of the hose heating element protrudes out the hose and into the wand. Gently heat wand with propane torch to ease separation if needed.
2. Remove the compression fitting nut that holds the heating element in the wand or boom, then remove the complete compression fitting.
3. Pull the element out and to the side far enough to allow a new element to be slid in along side the old element.
4. Connect one lead of the new element to the large terminal of the 24V alternator, and the other lead to a good chassis ground. Use 10 gage (minimum) jumper wires.
5. Start the engine, as the heating element heats, insert it along side the old element. Start and stop the engine, or disconnect the jumper wires, as needed to regulate the heat of the element. Use only enough heat to soften the material and allow the element to be pushed into the wand or boom.
6. Pull the old heating element from the wand or boom.
7. Secure new heating element in compression fitting, then reconnect electrical connector.

WARNING: *The heating element will be HOT, wear protective clothing, leather welding gloves, and safety gear.*

NOTE: *An alternate method is to remove all insulation from the wand or boom., then heat as needed with a torch to soften the material allowing removal and installation of the heating element.*

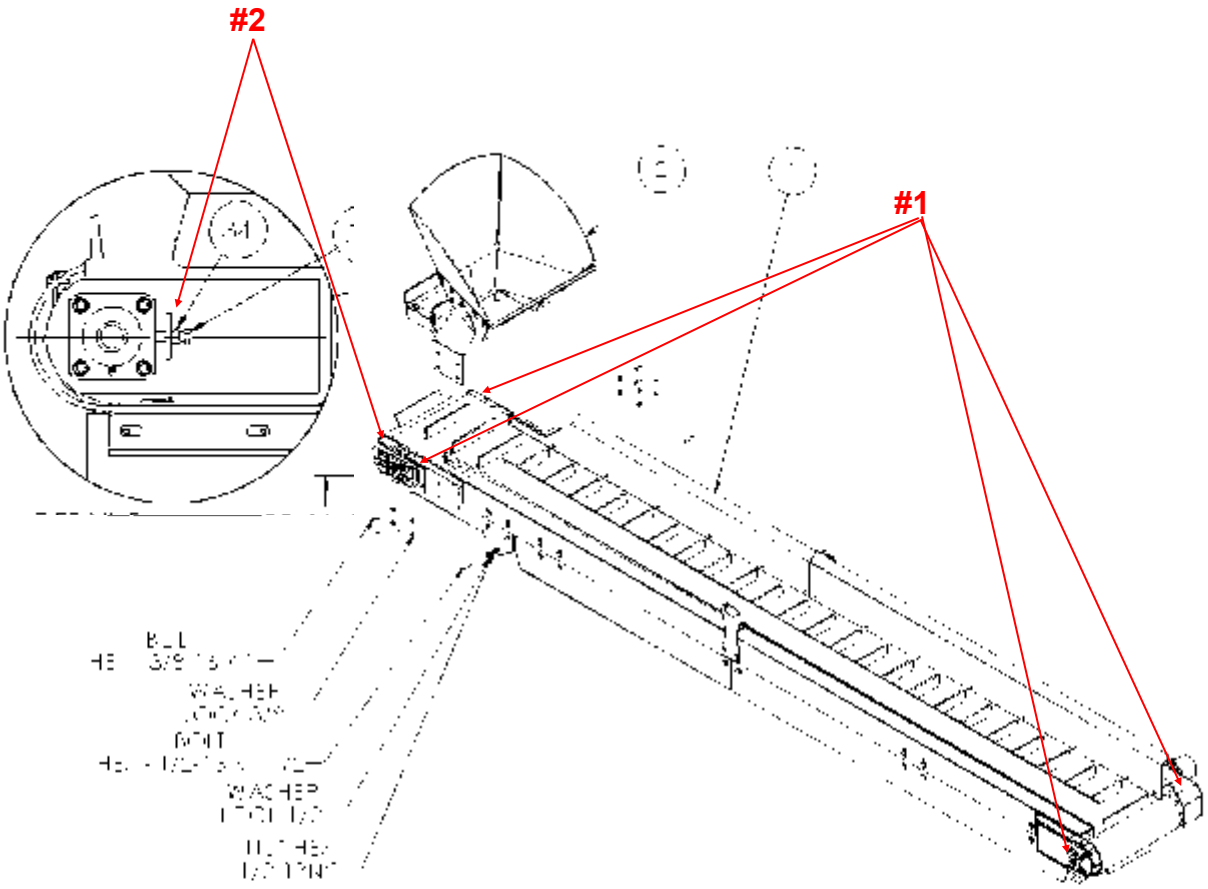
The SRM has many high torque moving parts. As a weekly inspection, we suggest that the operators check for loose fittings and loose bolts. Outlined below are some that need to be checked periodically due to the torque and vibration that the unit incurs.

1. Check for tightness of the motor and gear box assembly (#1). Because of the torque required to mix the materials, this needs to be checked weekly.
2. Check grease bearing daily (#2). There is a bearing on each end of the pugmill and on each end of the conveyor.
3. Check top discharge door for proper operation (#3).
4. Visually inspect pugmill mixer blades for proper clearance and wear (#4).



The conveyor needs to be inspected daily for wear, and to make sure that the belt is tracking properly. As the belts are used, they will stretch, requiring tightening.

1. Check grease bearings daily (#1).
2. Check belt tension and tracking (#2). To adjust tracking, you must first loosen the 4 nuts on the bearing. Do not loosen too much, you need a little tension on the nuts. Loosen the jam nut on the tension bolt and tighten or loosen the bolt tensioner the direction that you need the belt to go. Re-tighten the bearing bolts and lock jam nut down. **NOTE:** *Make all adjustments with the conveyor in the off position*. Once you make the adjustments, start the conveyor to check tracking.



TROUBLESHOOTING

	POSSIBLE CAUSE	*Items to Check /Service*
LACK OF PERFORMANCE	Plugged Strainer Screen	Service strainer screen
	Hydraulic Filter Plugged	Replace hydraulic oil filter
	Collapsed Suction Hose	Replace suction hose and service strainer screen
	Air Leak in Suction Hose	Replace hose
	Low Fluid Level	Fill reservoir to proper level
	Over Heated Hydraulic Fluid	Clean oil cooler fins with pressurized water
	Worn Pump or Hydraulic Motor	Adjust, rebuild, or replace as necessary
	Crushed Hydraulic Lines	Replace line
	Engine at Idle	Speed engine up
HYDRAULIC MOTORS DO NOT TURN OR TURN SLOWLY	Product in Tank not Melted	Allow for more time for product to melt
	Foreign Material Jamming Agitator	Remove foreign material from agitator
	Foreign Material Jamming Product Pump	Remove foreign material from product pump
	Flow Controls on Valve Need to be Adjusted	
	Also see “Lack of Performance”	
UNUSAL NOISES	Low Hydraulic Fluid	Fill reservoir to proper level
	Air Leak in Suction Hose	Replace hose
	Damaged Pump or Hydraulic Motors	Repair or replace as necessary
EXCESSIVE OIL LEAKS FROM PUMP OR HYDRAULIC MOTOR SHAFT	Bad Shaft or Shaft Seal	Replace as necessary
	Loose Fittings	Tighten fittings

	POSSIBLE CAUSE	*Items to Check /Service*
PRODUCT PUMP DOES NOT TURN	Product in Tank not Melted	Allow more time for product to melt
	Foreign Material Jamming Product Pump	Remove foreign material from product pump
	Pump Motor not Functioning	Refer to “Hydraulic System” Trouble Shooting
LACK OF FLOW FROM WAND	Product Temperature too Cold	Heat product to manufacturers recommended temperature
	Product Froze in Wand & Hose	Allow additional time for heating element to melt product in hose
	Non-functioning Heat Element in Hose	Refer to “Electric Wand & Hose” Trouble Shooting
	WPC Valve not Positioned Correctly	Refer to operating instructions for WPC Valve position
	WPC Valve and External Plumbing Froze	Heat to re-melt product
	Worn Product Pump	Adjust or repair product pump as necessary

TROUBLE SHOOTING

Product Pump

Lack of flow from wand.

Check for rotation of product pump.

No Rotation → **Engage pump control and observe engine RPM.**

Little or no change in RPM → **Refer to hydraulic system trouble Shooting.**

Rotation → **Check that the pump control is in the "Pump" position and not "Reverse".**

Definite RPM drop → **Check that the product is at working Temperature.**

CAUTION: *Product repeatedly heated beyond manufacturer's recommended heating cycles will harden and be difficult or impossible to remove from machine.*

Electric wand & hose heat on. Allow 30 to 40 minutes to heat.

Little or no heat in wand or hose → **Refer to electric wand & hose troubleshooting.**

Wand & hose hot → **Position WPC valve toward "Wand" position and observe engine RPM's.**

Definite RPM drop → **Indicates a plugged/ frozen wand or hose; allow additional time for heating elements to work. Also check for a plugged valve or nozzle at the end of the wand, or frozen plumbing next to WPC valve. Heat if necessary.**

Little or no change in RPM → **Check for loose pump pick-up tube and that tube is in product**

Check pump packing for excessive leakage.

Excessive Leakage → **Adjust packing per Mfg. instructions.**

No Excessive Leakage → **Adjust pump end clearance per Mfg. instructions.**

Lack of flow from wand → **Rebuild or replace as necessary.**

Normal flow from wand → **System functioning properly; return unit to service.**

Normal flow from wand → **System functioning properly; return unit to service.**

TROUBLE SHOOTING

Electric Wand

No heat, or low heat in wand or hose.

With engine OFF, Check for loose pulleys and loose or missing belts on 24 volt alternator.

Start engine, with wand switch OFF check voltage at battery terminal of 24 volt alternator.

9 volts or less → Check for a dead battery, then check for an open resister or open wires from battery to alternator, or a shorted wire between the alternator and control panel switch and alternator and battery

24 to 28 volts

12 to 14 volts → Repair or replace alternator

With engine running, turn wand switch ON, check voltage at battery terminal of 24 volt alternator.

9 volts or less → Check for "short" between switch and heating elements. Alternately disconnect the wires to the hose and wand heating elements, when the voltage goes to 24 - 28 volts you have located the "shorted" circuit.

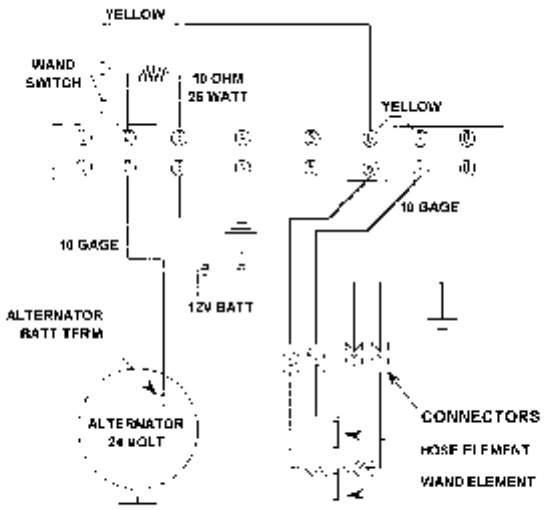
Check element resistance as follows:

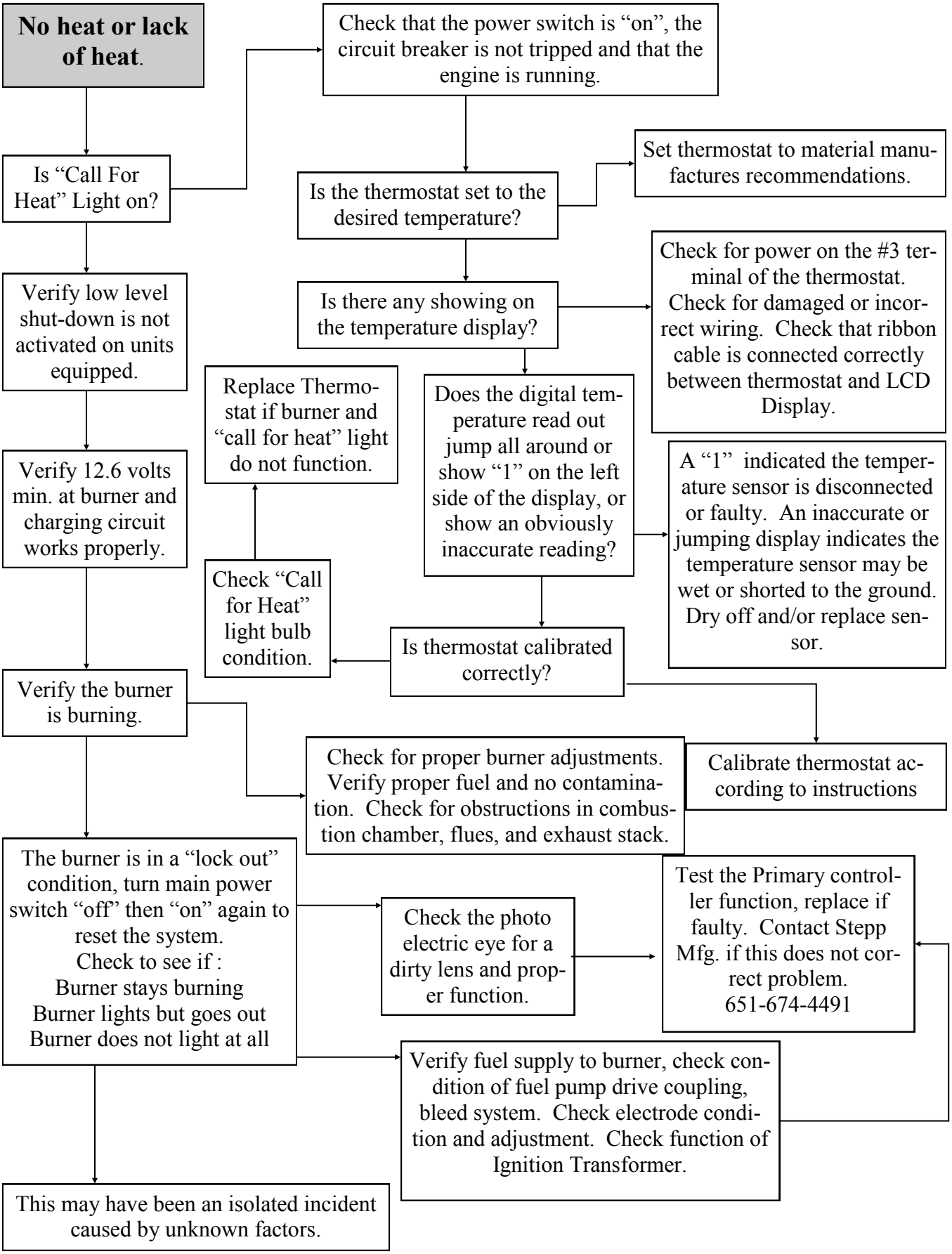
15' hose element: .4 to 1.0 W.
20' hose element: .5 to 1.2 W.
Wand element: .9 to 1.6 W.

Repair or replace as necessary.

24 to 28 volts

Check heating elements for an "open" condition. Check for faulty switch. Check for broken wires or loose connections from alternator to switch, and switch to heating elements.




No heat or lack of heat.
Check that the power switch is "on", the circuit breaker is not tripped and that the engine is running.
Is "Call For Heat" Light on?
Is the thermostat set to the desired temperature?
Set thermostat to material manufactures recommendations.
Verify low level shut-down is not activated on units equipped.
Is there any showing on the temperature display?
Check for power on the #3 terminal of the thermostat. Check for damaged or incorrect wiring. Check that ribbon cable is connected correctly between thermostat and LCD Display.
Replace Thermostat if burner and "call for heat" light do not function.
Does the digital temperature read out jump all around or show "1" on the left side of the display, or show an obviously inaccurate reading?
Verify 12.6 volts min. at burner and charging circuit works properly.
A "1" indicated the temperature sensor is disconnected or faulty. An inaccurate or jumping display indicates the temperature sensor may be wet or shorted to the ground. Dry off and/or replace sensor.
Check "Call for Heat" light bulb condition.
Is thermostat calibrated correctly?
Verify the burner is burning.
Check for proper burner adjustments. Verify proper fuel and no contamination. Check for obstructions in combustion chamber, flues, and exhaust stack.
Calibrate thermostat according to instructions
The burner is in a "lock out" condition, turn main power switch "off" then "on" again to reset the system.
Check to see if :
Burner stays burning
Burner lights but goes out
Burner does not light at all
Check the photo electric eye for a dirty lens and proper function.
Test the Primary controller function, replace if faulty. Contact Stepp Mfg. if this does not correct problem.
651-674-4491
Verify fuel supply to burner, check condition of fuel pump drive coupling, bleed system. Check electrode condition and adjustment. Check function of Ignition Transformer.
This may have been an isolated incident caused by unknown factors.

Primary Controller Burner MTD/Hard Wired

NOTE: *The primary controller can be bench tested for proper operation using an automotive type, 12 volt battery as a power source. Refer to the wiring schematics for wire identification.*

1. Remove controller from burner. Mark all wires for proper reassembly.
2. Using two test lights, or volt meters, connect one to the blue wire, and one to the white/orange wire of the controller. Connect the black leads of your test instruments to the negative (-) terminal of the battery.
3. Connect the black wire from the controller to the negative (-) terminal of the battery.
4. Connect the red, white/red, and the white wires together, then connect these three wires to battery (+) terminal. Both test instruments should show voltage for approximately 15 seconds. After 15 seconds, the controller should "lock out" and no voltage will be present.
5. Repeat step #4, only this time connect the two yellow wires from the controller together three seconds after applying power to the three wires of the controller. (This simulates the controller receiving a "flame" signal from the photo electric eye). The white/orange wire should show voltage as long as the controller is hooked to the battery. The blue wire should only show voltage for about 15 seconds. Replace the controller if it fails any of these tests.

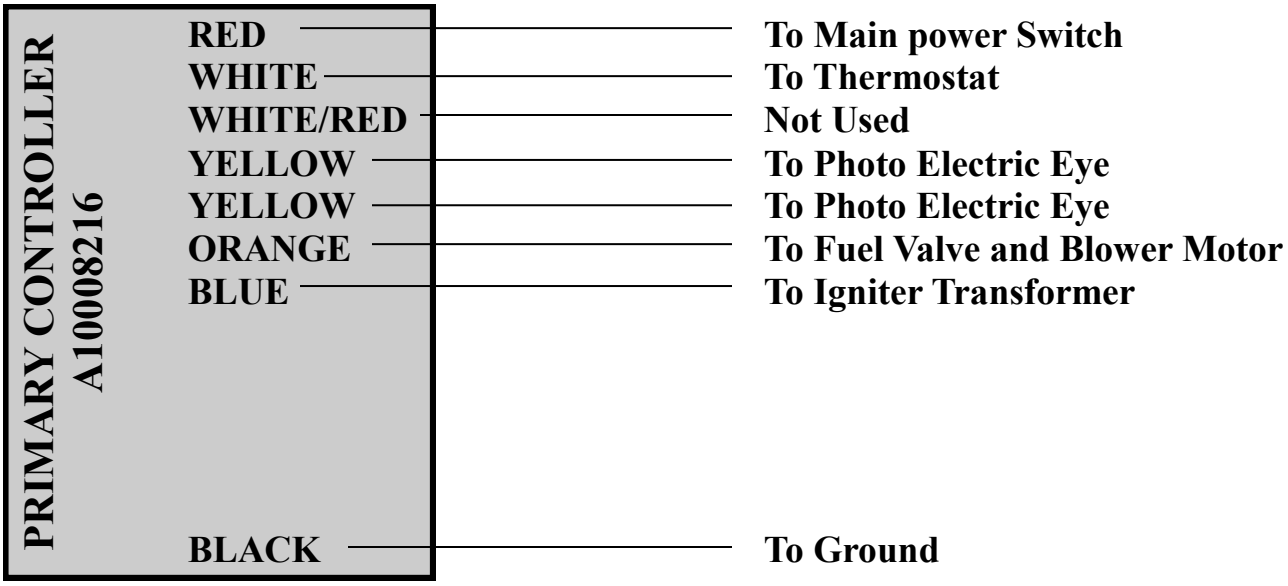
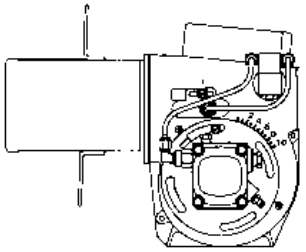


Photo Electric Eye



NOTE: *The Photo Electric Eye can be bench tested for proper operation using an ohm meter. Assure the lens of the Photo Electric Eye is clean prior to testing.*

1. Block off all light to the Photo Electric Eye. Test across the leads with your ohm meter; you should get an infinite resistance reading (a lot of resistance).
2. Point the Photo Electric Eye at a light source, the brighter the light, the less resistance your ohm meter will show. **CAUTION:** *Replace the Photo Electric Eye if it does not respond in this way.*

Fuel Valve

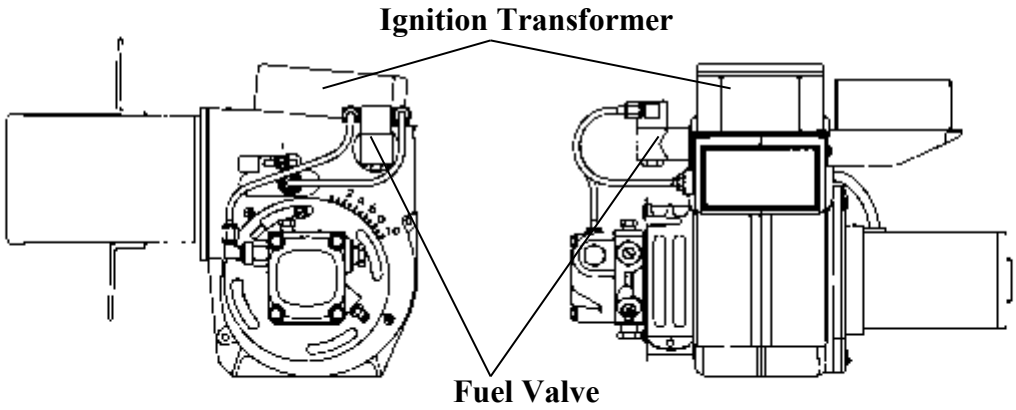
NOTE: *The Fuel Valve can be bench tested for proper operation using an automotive type 12 volt battery as a power source.*

1. Disconnect the two leads and remove the fuel lines from the fuel valve.
2. The valve should be closed when no power is available.
3. Apply 12 volts to the two leads and the valve should open. **CAUTION:** *Replace the fuel valve if it does not respond in this way.*

Ignition Transformer

WARNING: *Shock hazard, high voltage up to 20,000 volts.*

1. Assure that 12 volts is being supplied to the transformer during the ignition cycle. (Refer to the Primary Controller tests.)
2. Check electrode condition and adjustment. Replace or adjust as necessary. **CAUTION:** *Replace ignition transformer if unit won't produce sparks.*

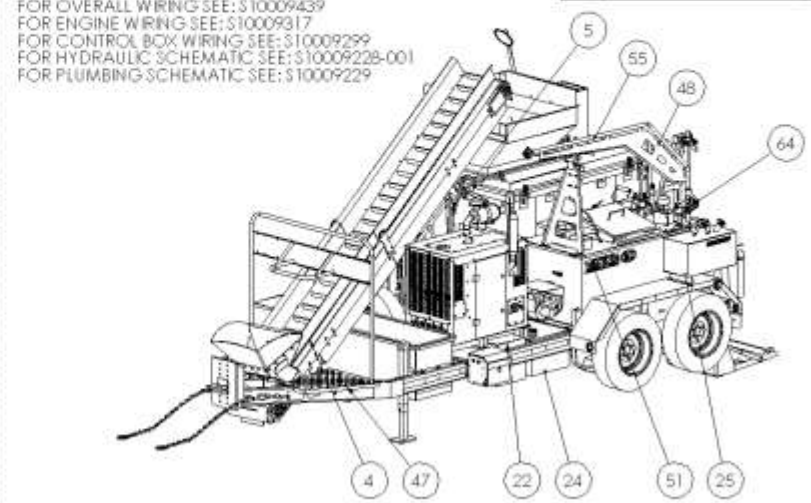


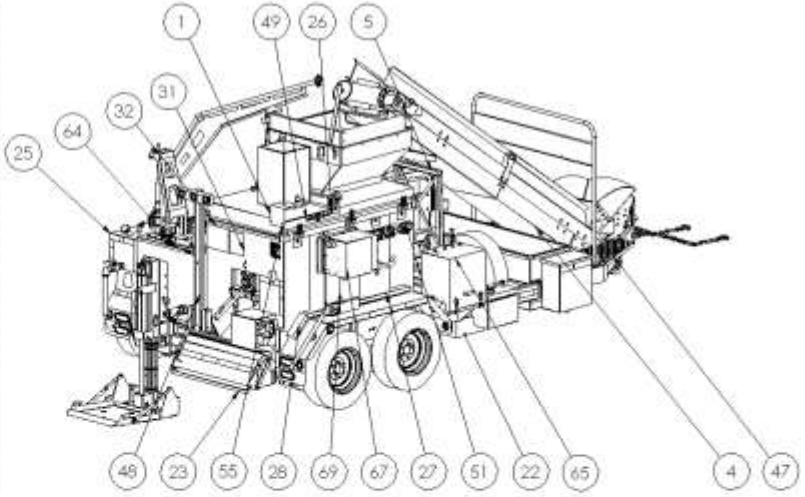
REPLACEMENT PARTS

ITEM NO.	QTY.	PartNo	Description-1	Description-2
70	1	M10011278	SERIAL TAG LASER	459RM1125CS127049
69	1	M10005028-001	SRM CENTER WIRE GUARD	STANDARD WIRE GUARD
68	1	K10009025-003	RECYCLER LIGHT PKG	LED 4 LIGHT SYS SRM
67	1	A10011277	CONTROL BOX SRM 10 PLC	CONTROL BOX ASSY
66	1	P10009221	HEATER WATLOW 6W/SQ. IN	1.5 KW 100-500 120V
65	1	A10009175-001	RECY. VALVE ASSY 5 BANK	RECY. STD. VALVE ASSEMBLY
64	1	A10009430	HOT OIL FINAL ASSY	120 GAL HOT OIL TANK
63	1	K10009435-007	BOOM, LESS HEAT, ALU WAND	SRM WAND/BOOM KIT
62	1	A10011245	PELLET BIN SRM 450# ASSY	PELLET BIN SRM 450# ASSY
61	1	A10006024-004	COMPACT CARRIER FINAL ASSY	HYD. LIFT NO POSITION SENSOR
60	1	P10004643	TIRE & WHEEL 225R/15	225R/15 LR D 2540 L8 6 BOLT
59	1	M10008696	CC STANDOFF DOUBLER	RECY. CC STANDOFF
58	1	M10008690	RECYL CC STANDOFF	CC STANDOFF
57	1	K10009015-002	SRM WASHDOWN KIT	WITH HOSE HANGER
56	1	A10009380	SRM SHOVEL CLEANER ASSY	SRM SHOVEL CLEANER ASSY
55	1	A10006851-003	10 C.F. RECY. HOPPER ASSY	PAINTED ORANGE
54	1	A10006499-001	RECY. TRAILER - 672 DUE TANDEM	PINTLE HITCH STD SJ
53	1	A10004531-002	SPARE TIRE CARRIER, BOLT ON	6 BOLT PATTERN
52	1	A10003683	BREAKAWAY SWITCH W/CONNECTOR	
51	2	M10009034-001	BLACK VINYL	SRM SIDE LABEL
50	1	M10009033-001	BLACK VINYL	TOP DOOR ARM LABEL
49	1	M10009032-001	BLACK VINYL LABEL	RECY. STACK OPEN LABEL
48	1	A10009181-001	SRM LIGHT TUBE ASSY	LIGHT TUBE STANDARD
47	1	A10008702-001	SRM WORK PLAT. ASSY	SRM PLAT. W/O SHVL HLDERS
46	1	A10008225-002	1505 STD. - STD. CTRLS STRT	1505 FINAL ASSY
45	4	P10003134-002	POP RIVET CLOSED END	3/16 DIA x 1/8-1/4 GR
44	9	P10005139	SCREW SELF DRILL	1/4-20 X 1"
43	5	P10005051	GRIPSERT 1/4-20NC	1/4-20NC
42	8	P10001608-006	WASHER	LOCK 1/2
41	10	P10001608-004	WASHER	LOCK 1/4
40	4	P10001609-005	WASHER	FLAT 1/2
39	4	P10001605-007	BOLT	HEX - 1/2-13 X 3 1/2
38	4	P10001605-003	BOLT	HEX - 1/2-13 X 1 1/2
37	10	P10001601-001	BOLT	HEX - 1/4-20 X 3/4
36	8	P10001600-005	NUT HEX	1/2-13NC
35	2	P10008456-036	FLEX HOSE - 1" MNPT x FJIC	
34	4	P10001539-002	ELL - ST - 90°	1/4 NPT
33	2	P10001048-002	ELBOW - ST - 45°	1/4 NPT
32	1	T10009432	HOT OIL PROCEDURE	SRM 10-120 W/SPRAY WAND
31	1	T10009431	SRM HOT OIL OP CHART	HOT OIL OP CHART 01/11
30	1	M10008705	SRM PLAT. STRT DEFLECT	SRM WORK PLAT. ASSY
29	1	M10008704	SRM PLAT. STRT DEFLECT	SRM WORK PLAT. ASSY
28	1	M10005030	WIRE GUARD	SRM 10 RECYCLER
27	1	M10005029	WIRE GUARD	SRM 10 RECYCLER
26	1	M10002416-003	NUMBER TAG - 3	
25	1	A10008984	RECY. FINAL FLUSH ASSY	RECY. FINAL FLUSH TANK
24	1	A10008976	35 GAL HYD. TANK ASSY	RECY. HYD TANK FINAL
23	1	A10008950	SRM MAT. PLATFORM ASSY	SRM SHOVEL PLATE
22	1	A10008792	60 GAL FUEL TANK ASSY	RECY. FUEL TANK FINAL
21	1	A10007897-062	HOSE- 1-1/2 SUCTION	1-1/2MNPT - #24FSJIC - FER
20	1	A10007861-120	HOSE-FUEL ASSY	1/4 MNPT-KNS-FER
19	1	A10007861-030	HOSE-FUEL ASSY	1/4 MNPT-KNS-FER
18	1	A10007861-015	HOSE-FUEL ASSY	1/4 MNPT-KNS-FER
17	2	A10007872-000	HOSE - PROD. - 1" x LENGTH	16MKNPT X 16 FSJIC
16	1	A10007867-096	HOSE ASSY - 3/4-HYD HIGH	12FSJIC X 12FSJIC
15	1	A10007867-052	HOSE ASSY - 3/4-HYD HIGH	12FSJIC X 12FSJIC
14	1	A10007867-048	HOSE ASSY - 3/4-HYD HIGH	12FSJIC X 12FSJIC
13	1	A10007864-036	HOSE ASSY - 3/8-HYD HIGH	6FSJIC X 6FSJIC
12	2	A10007863-034	HOSE-1/2-HYD HIGH ASSY	8FJICS X 8MNPTR
11	2	A10007863-000	HOSE-1/2-HYD HIGH ASSY	8FJICS X 8MNPTR
10	2	A10007862-095	HOSE-1/2-HYD HIGH ASSY	8FJICS X 8FJICS
9	3	A10007862-036	HOSE-1/2-HYD HIGH ASSY	8FJICS X 8FJICS
8	2	A10007862-024	HOSE-1/2-HYD HIGH ASSY	8FJICS X 8FJICS
7	1	A10007860-052	HOSE-1/4-HYD HIGH ASSY	4FJICS X 4FJICS
6	1	A10007850-048	HOSE-1/4-HYD HIGH ASSY	4FJICS X 4FJICS
5	1	A10007188	CONVEY SUPPORT LEG ASSY	RECY TRAILER ASSY
4	1	A10006475	LOADER CONVEYOR ASSY	FINAL CONVEYOR ASSY
3	3	A10006025	FUEL FILTER ASSY	3/8" NPT FITTINGS
2	1	A10005104-006	FINAL BATTERY BOX ASSY	NO BREAKAWAY / NO CABLE
1	1	M10005688	STROBE LIGHT MTG BRACKET	STEPP MFG PARTS

ADDITIONAL INFORMATION:
FOR LIGHTING SCHEMATIC SEE: S10009438
FOR OVERALL WIRING SEE: S10009439
FOR ENGINE WIRING SEE: S10009317
FOR CONTROL BOX WIRING SEE: S10009299
FOR HYDRAULIC SCHEMATIC SEE: S10009228-001
FOR PLUMBING SCHEMATIC SEE: S10009229

REVISIONS			
REV.	DESCRIPTION	DATE	APPR
A01	RELEASED FOR PROTOTYPE	9/13/2012	





STEPP MFG

STEPP MFG. CO. INC.

459RM1125CS127049

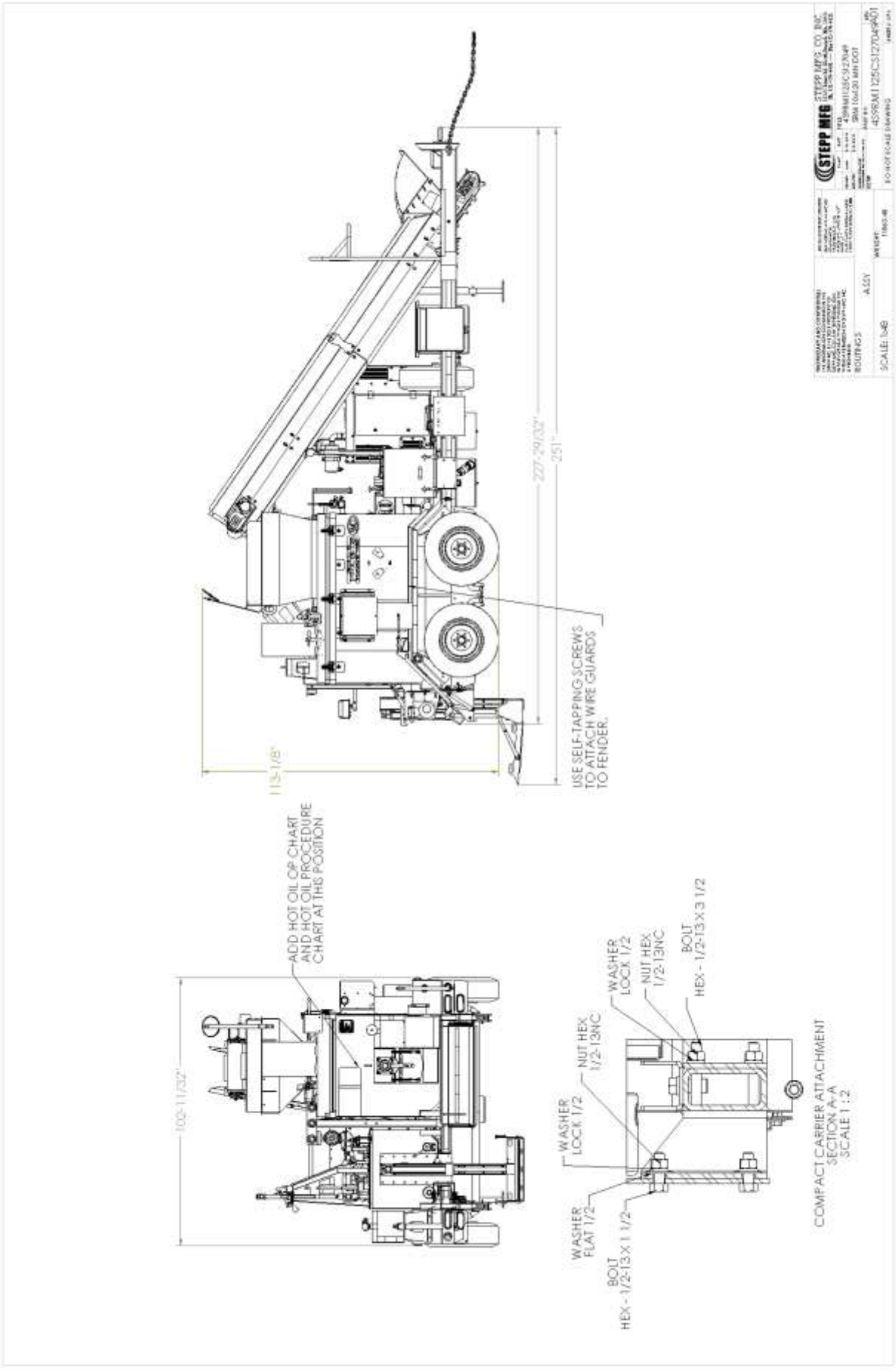
SRM 10x20 MH DOT

ROUTING 3

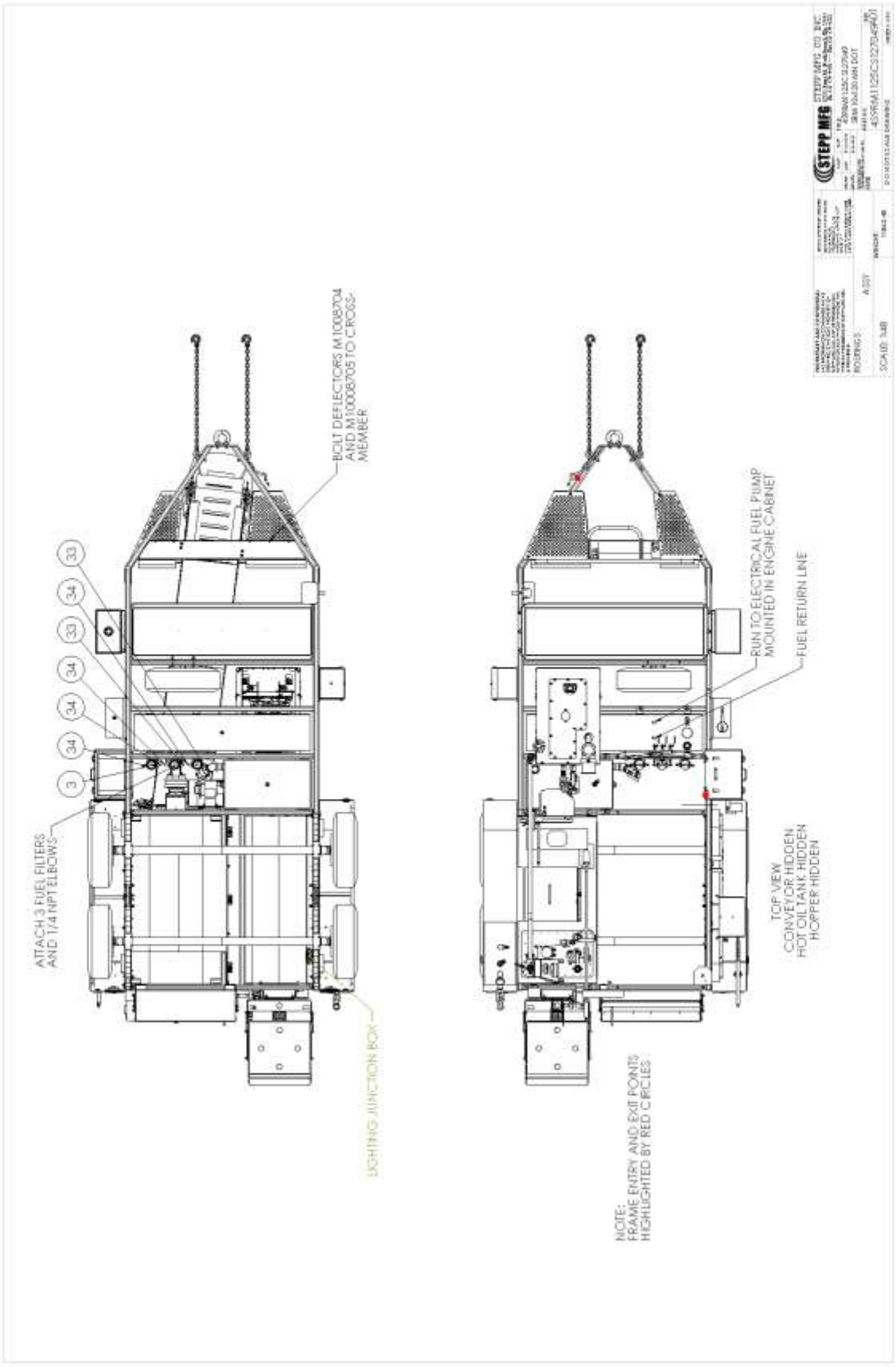
ASSY

SCALE: 1:48

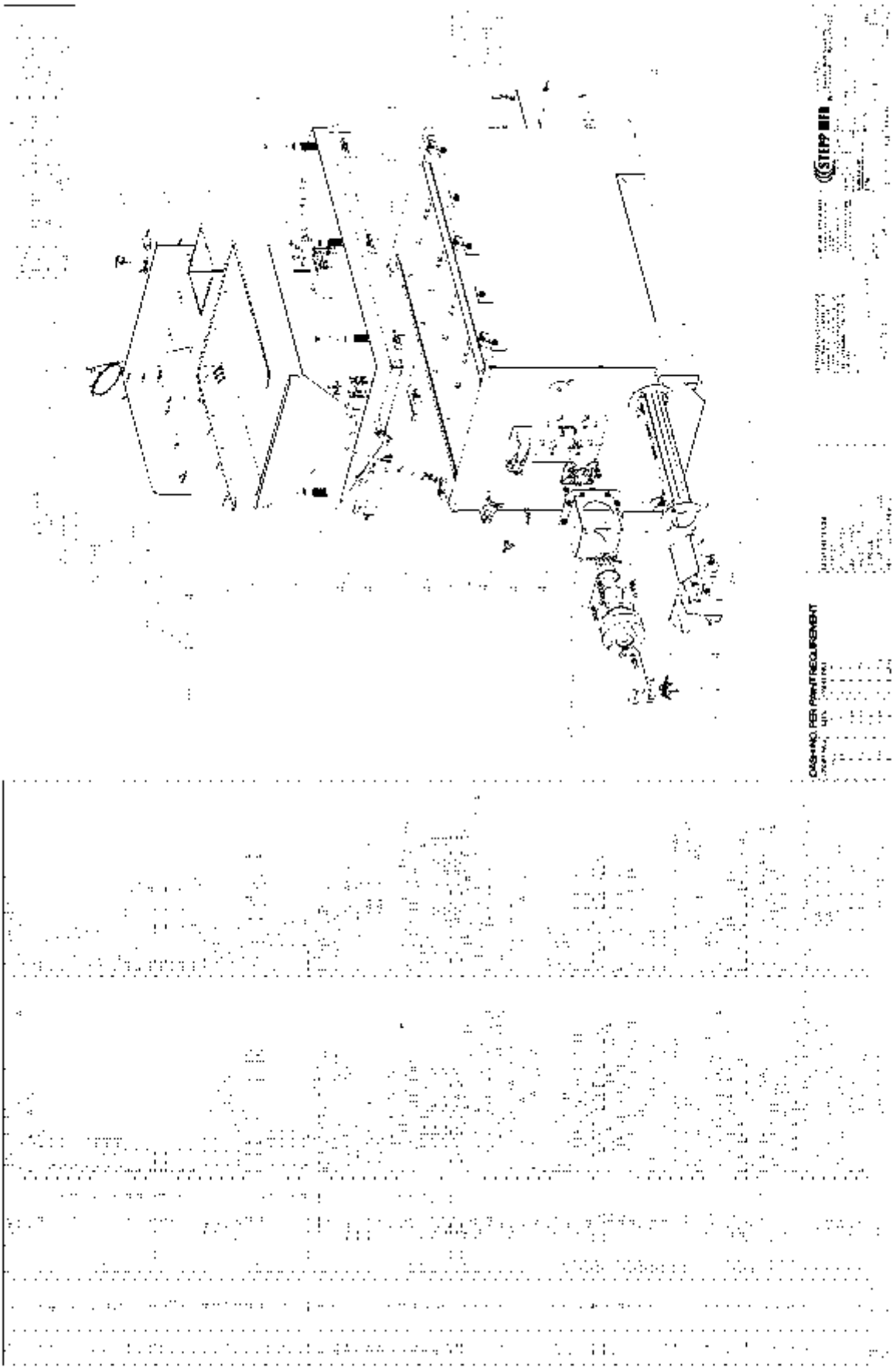
459RM1125CS127049A01


227-29/32"
251"
USE SELF-TAPPING SCREWS TO ATTACH WIRE GUARDS TO FENDER.
113-1/8"
ADD HOT OIL OP CHART AND HOT OIL PROCEDURE CHART AT THIS POSITION
102-11/32"
WASHER LOCK 1/2
NUT HEX 1/2-13NC
BOLT HEX - 1/2-13 X 3 1/2
NUT HEX 1/2-13NC
WASHER LOCK 1/2
WASHER FLAT 1/2
BOLT HEX - 1/2-13 X 1 1/2
COMPACT CARRIER ATTACHMENT SECTION A-A SCALE 1 : 2

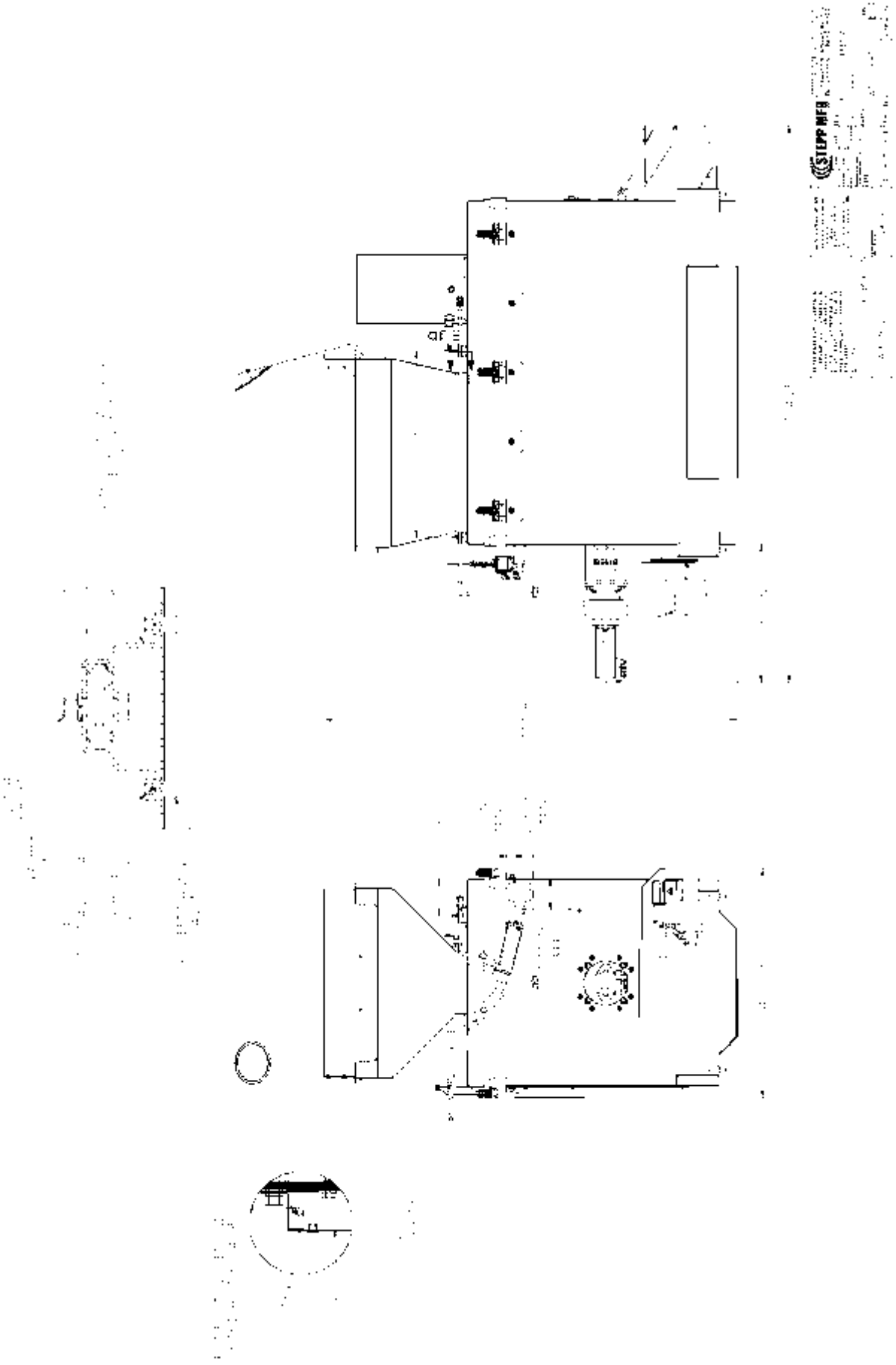
Pugmill & Mixing Chamber



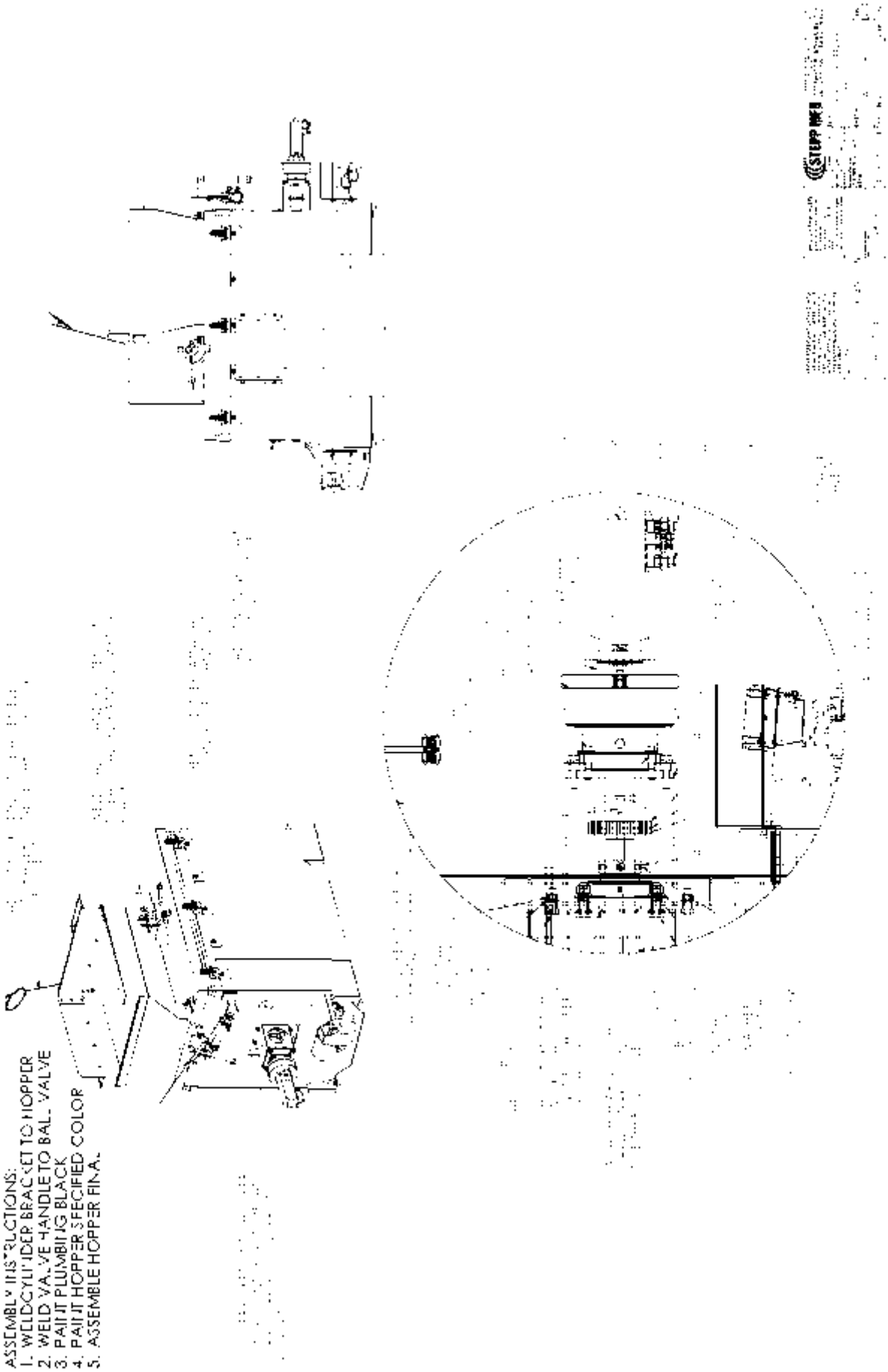
Pugmill & Mixing Chamber



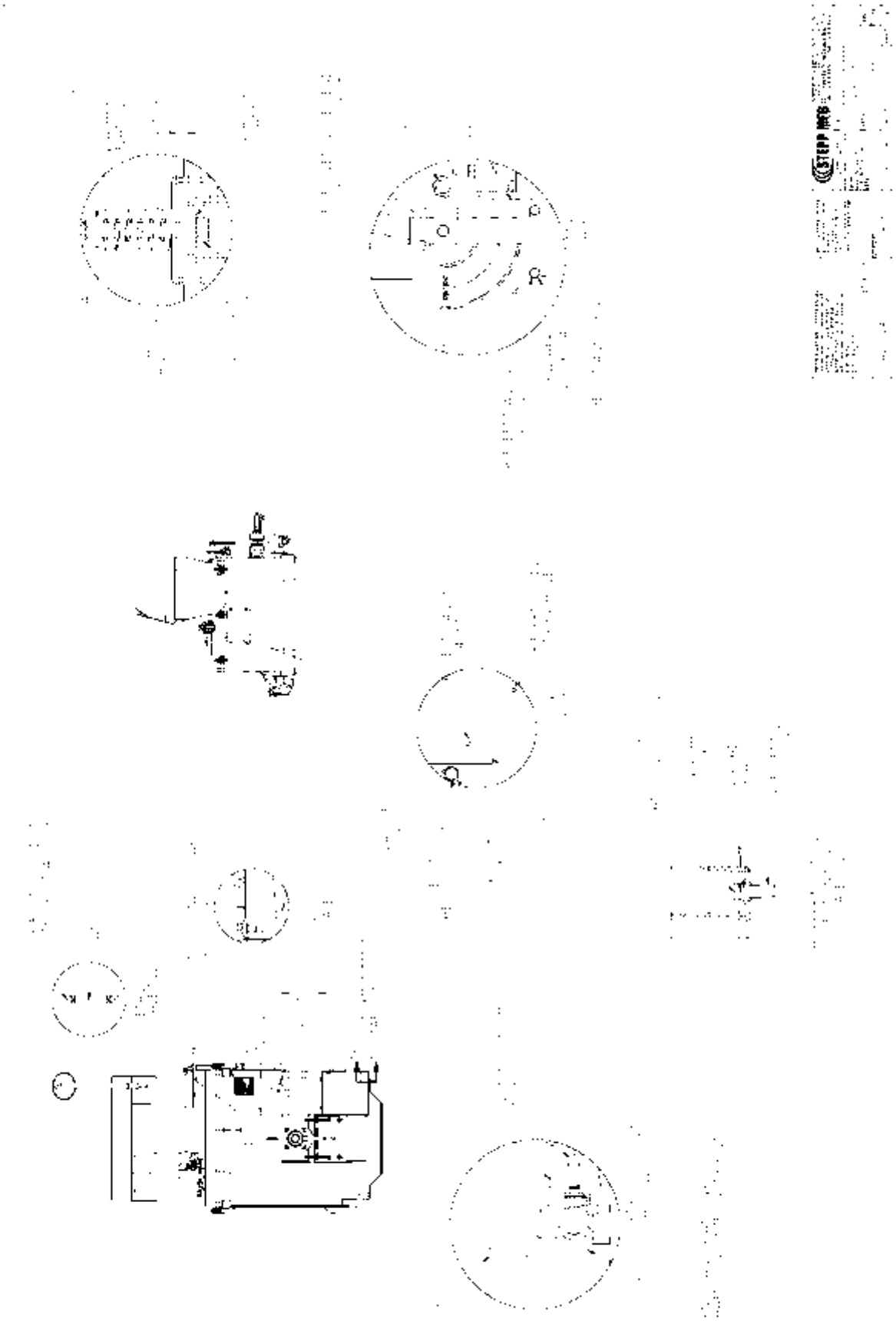
Pugmill & Mixing Chamber

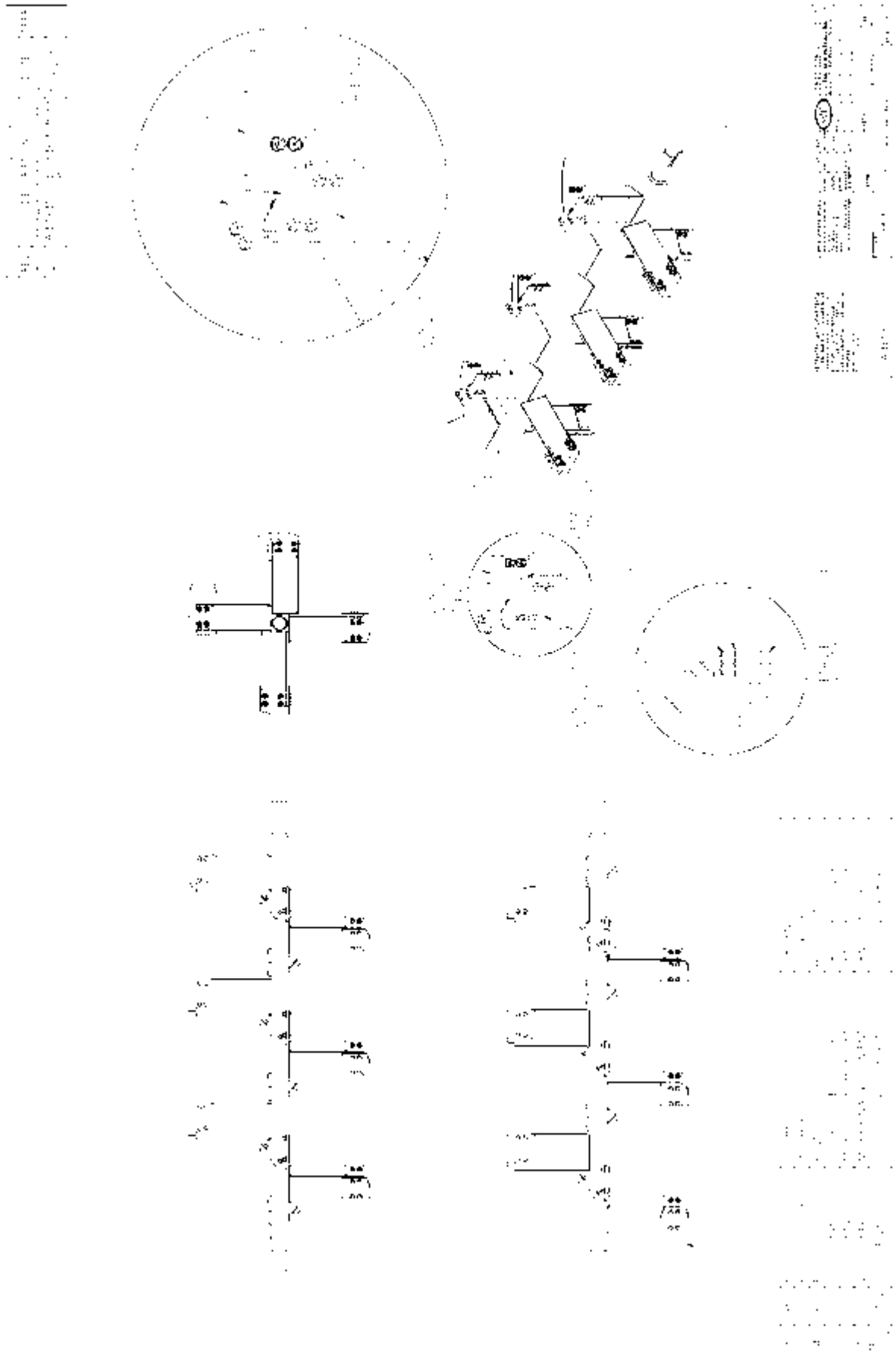


Pugmill & Mixing Chamber

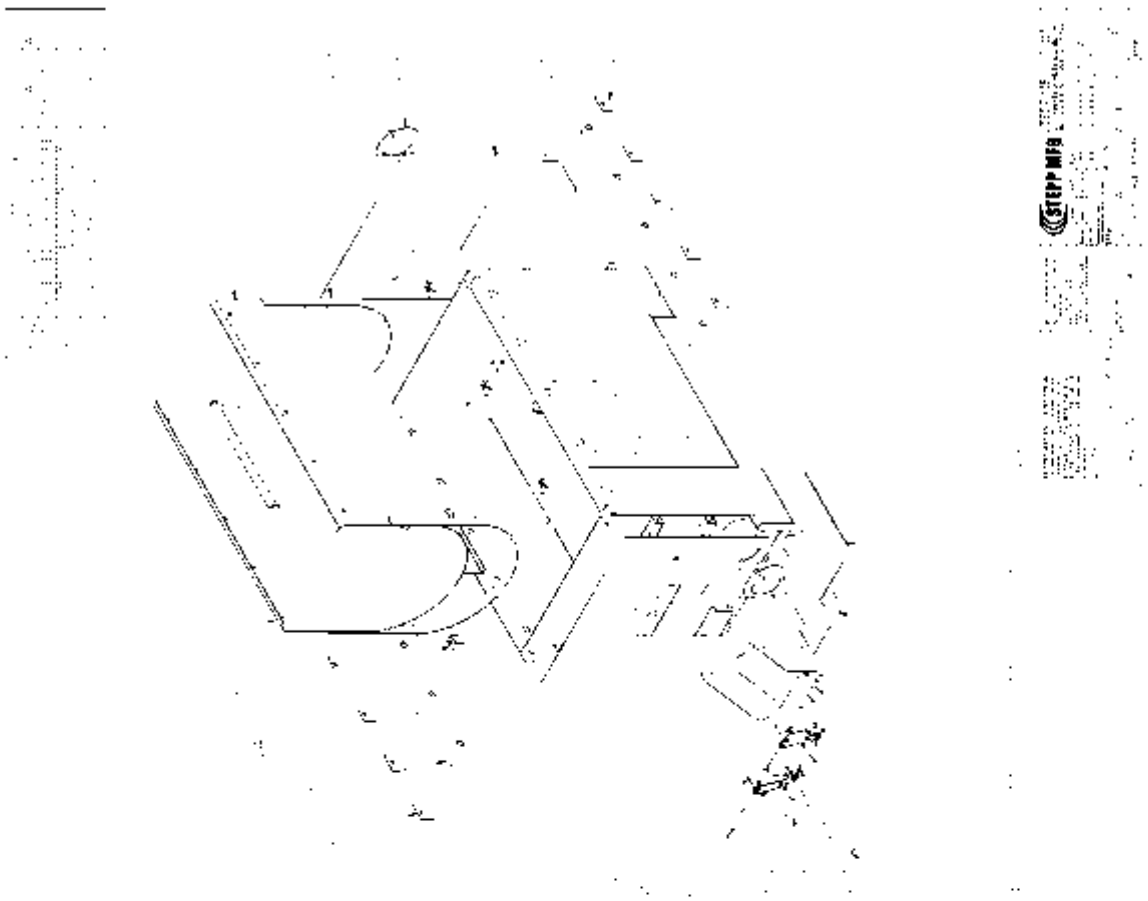


Pugmill & Mixing Chamber

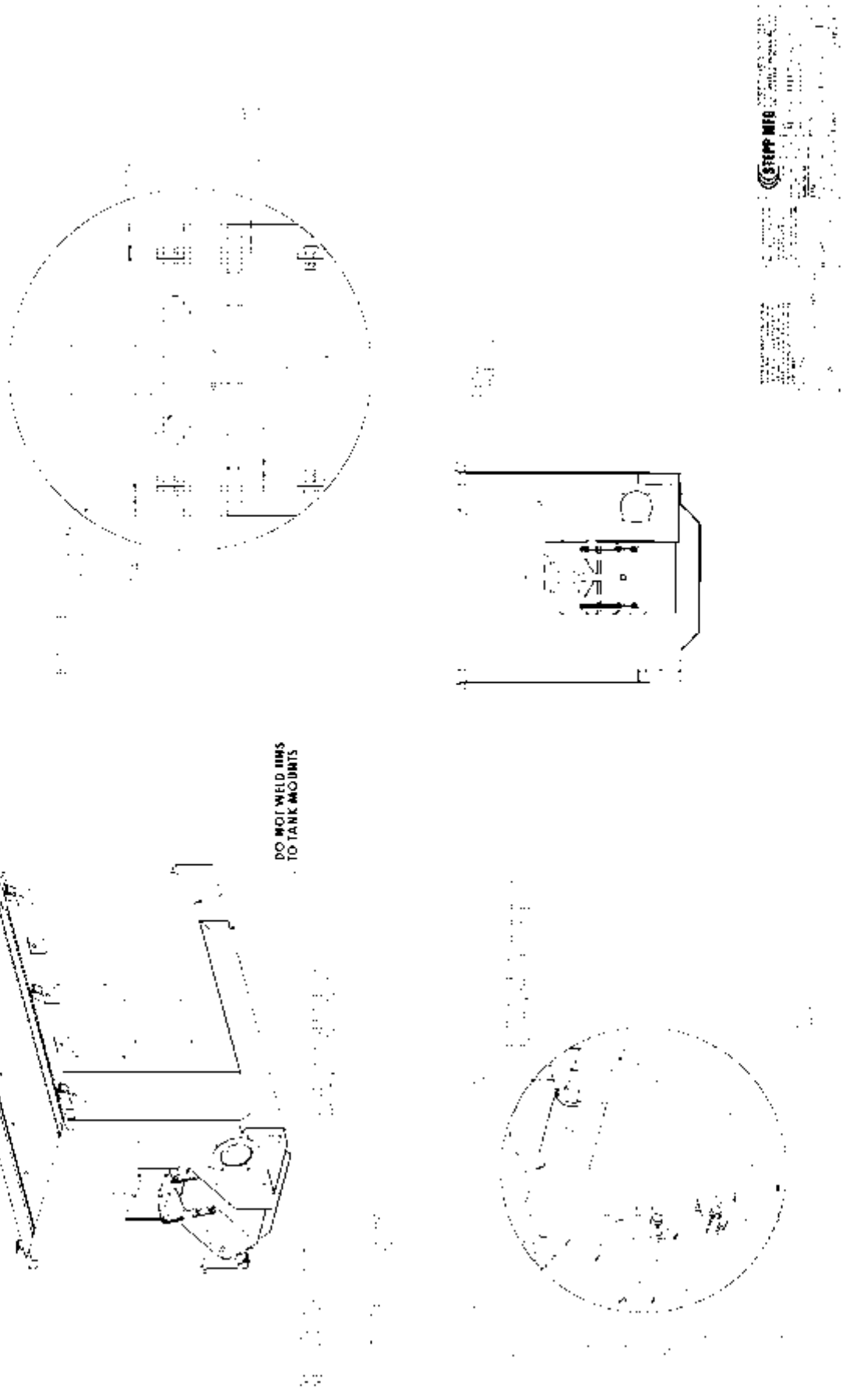




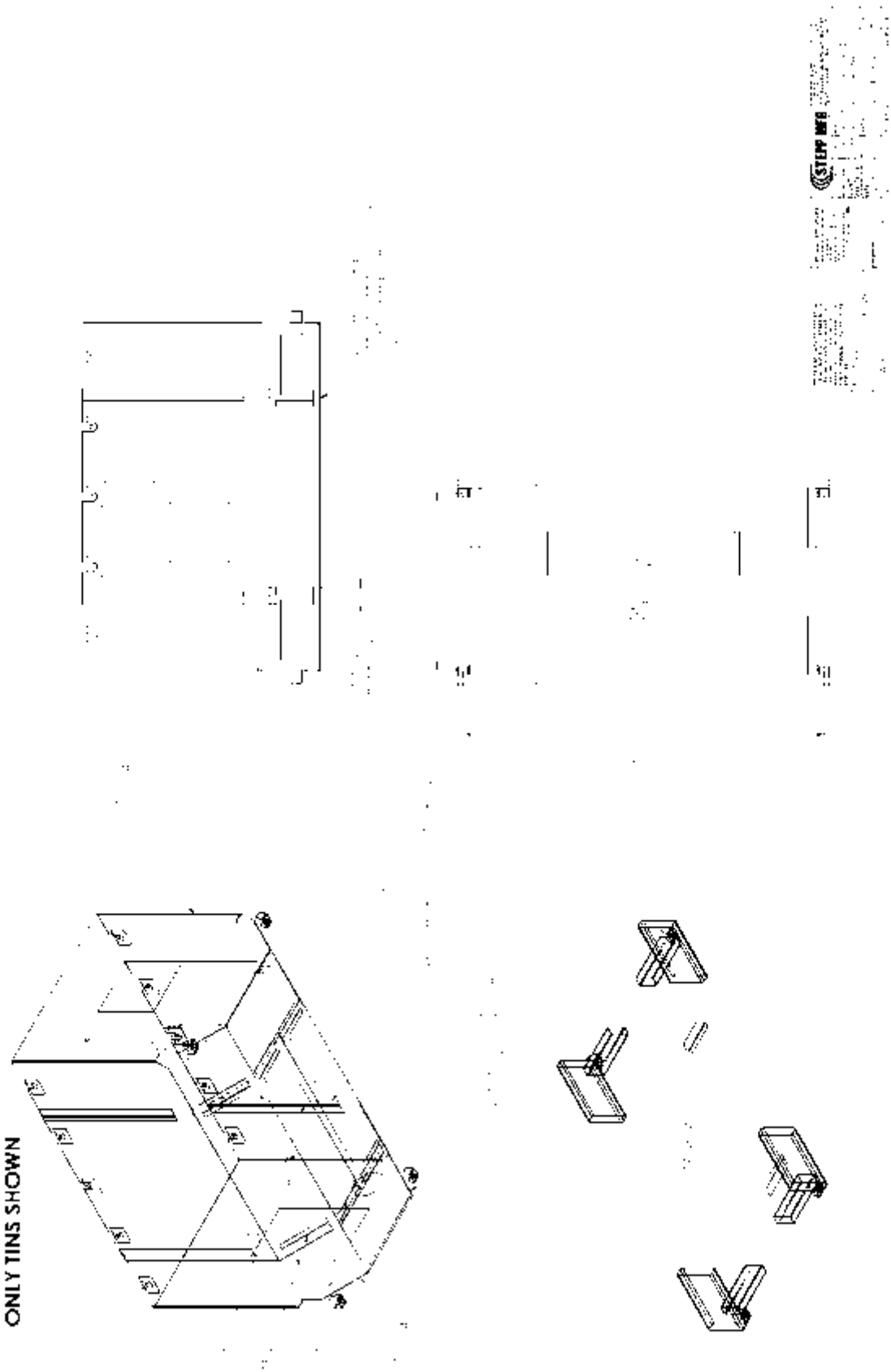
Pugmill & Mixing Chamber



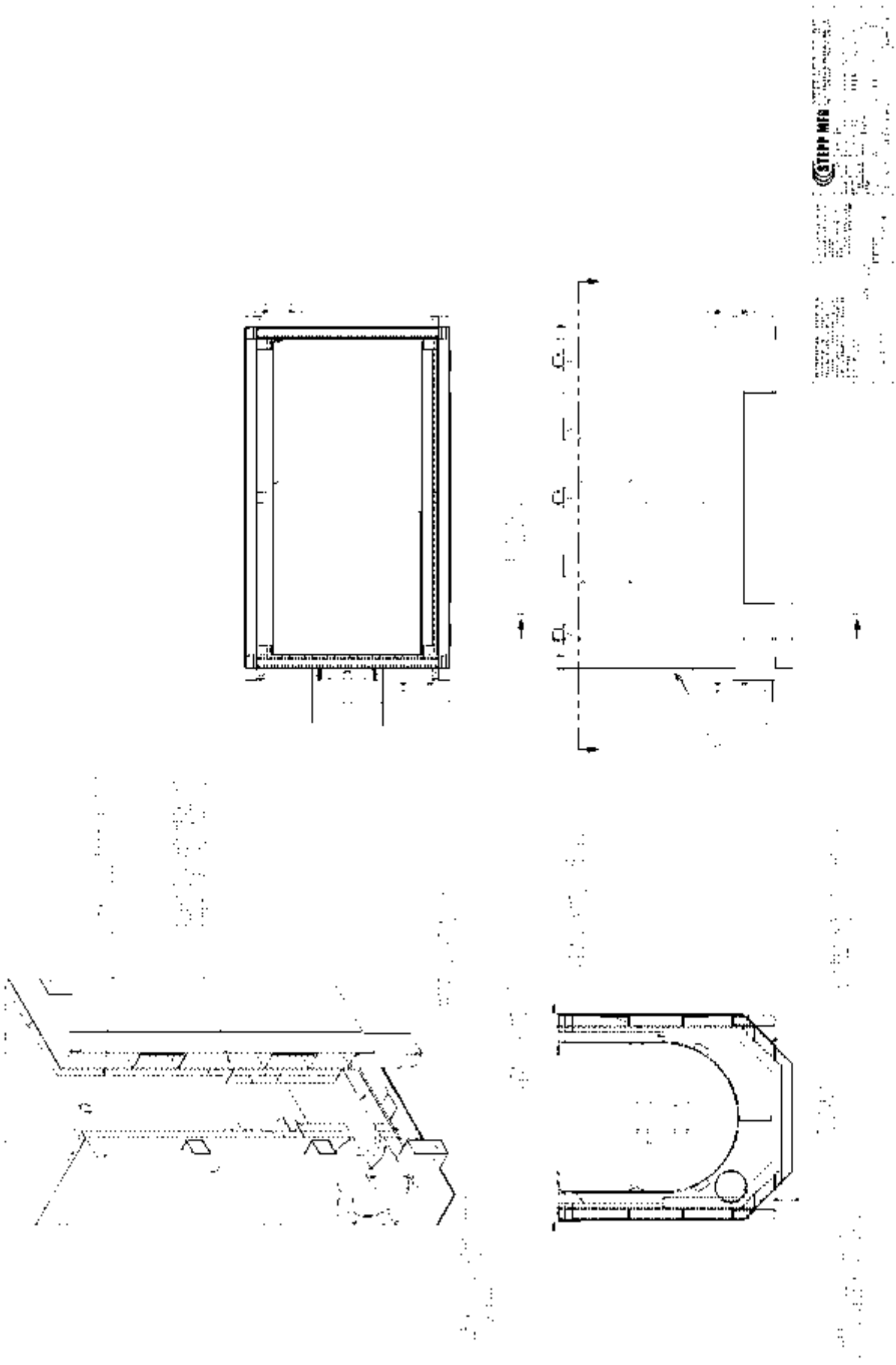
Pugmill & Mixing Chamber



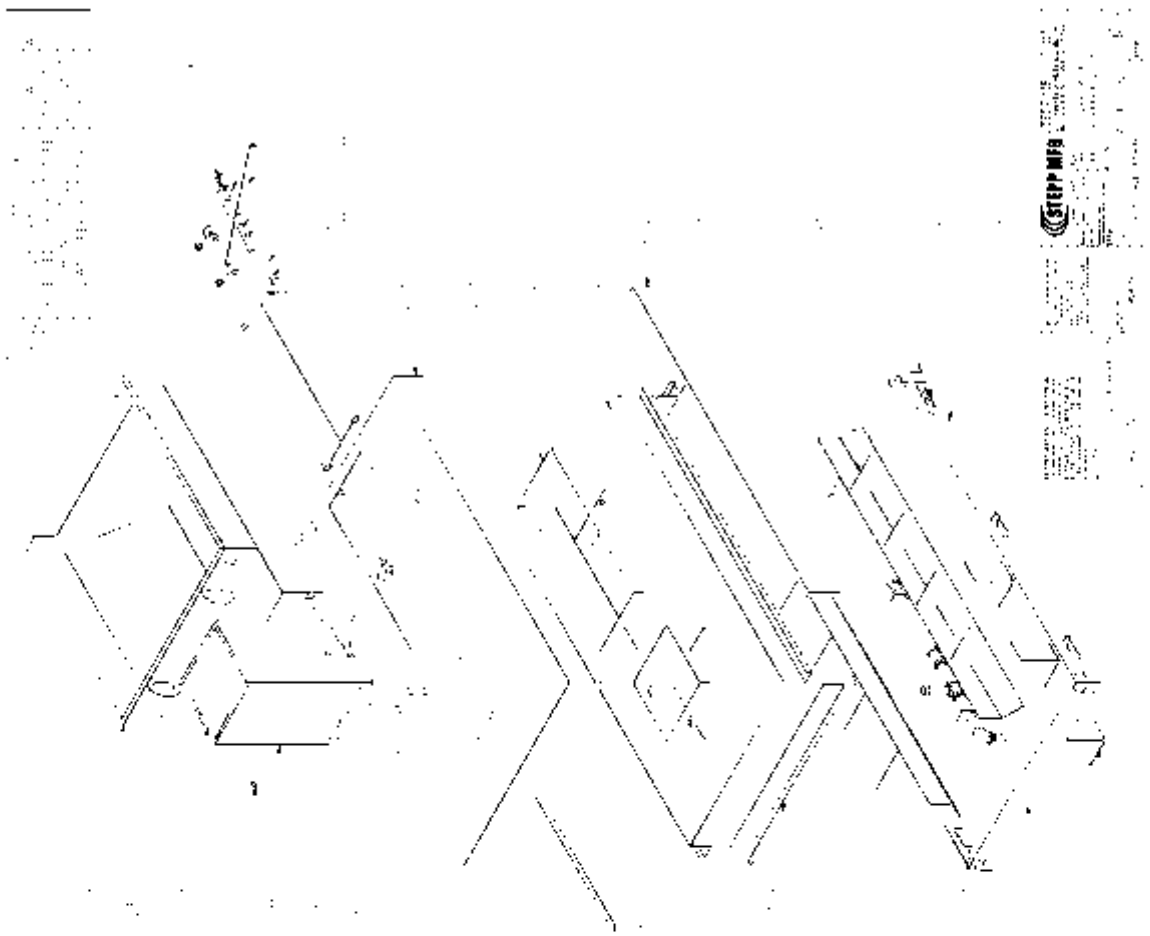
Pugmill & Mixing Chamber



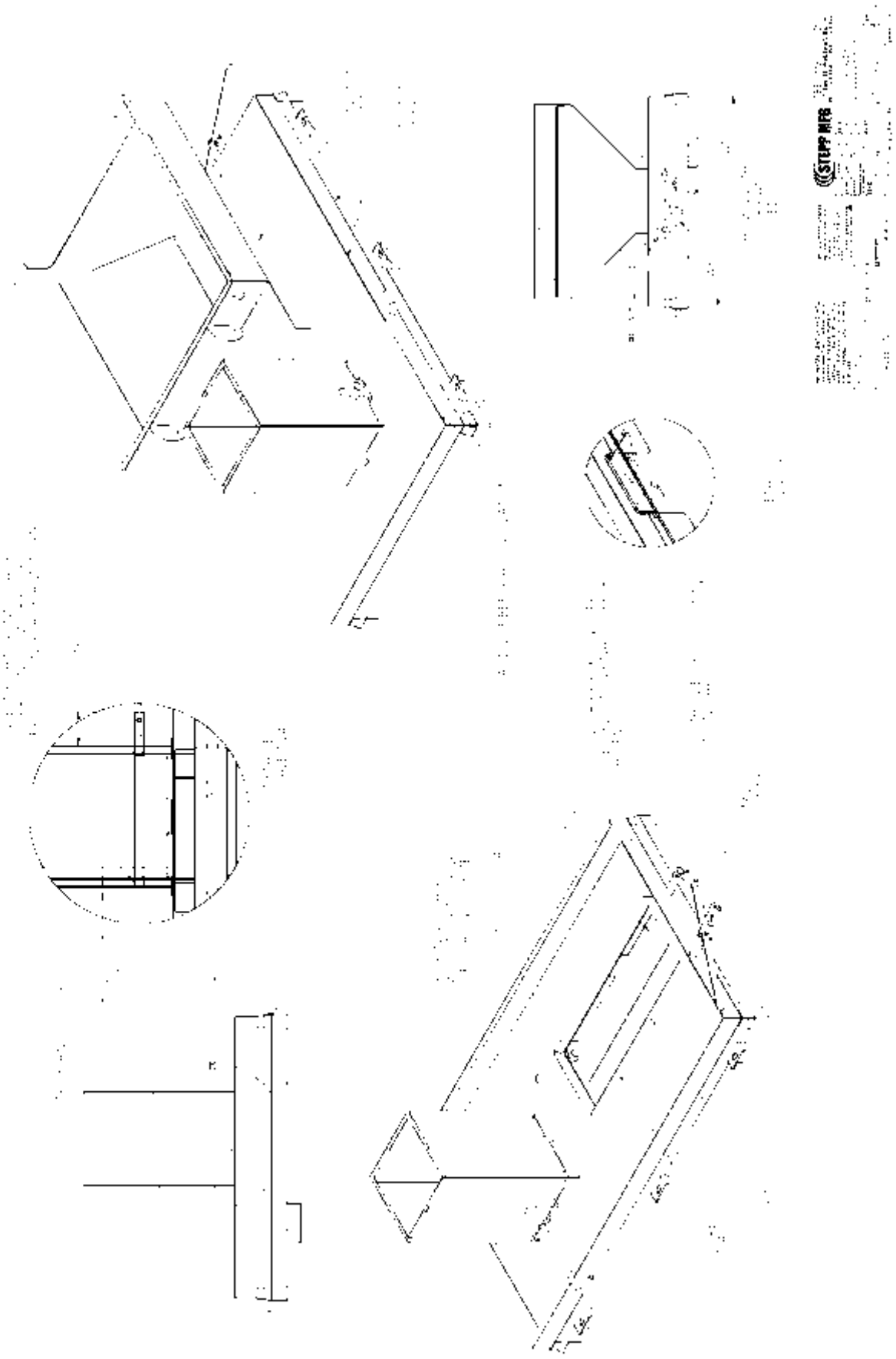
Pugmill & Mixing Chamber



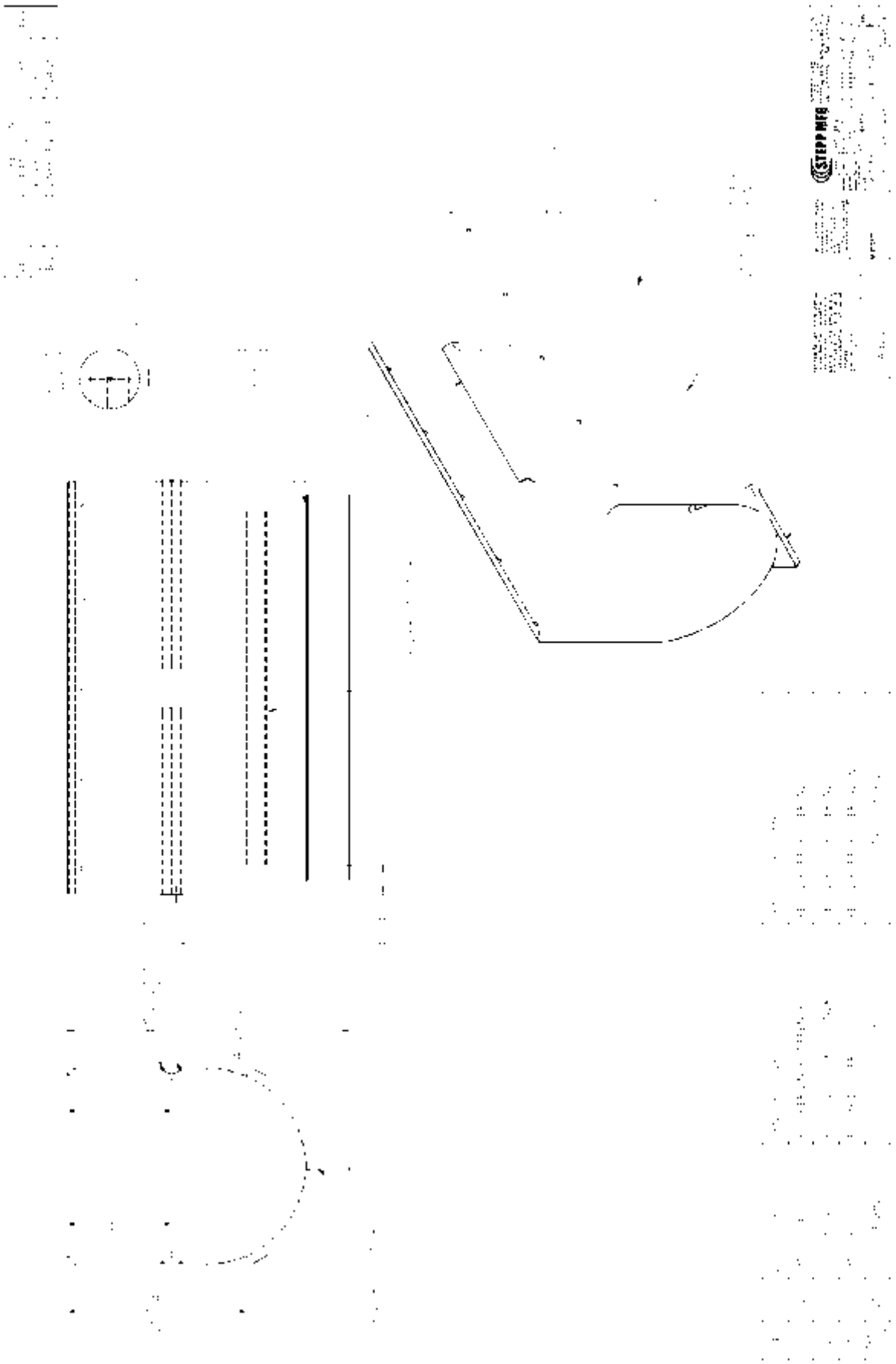
Pugmill & Mixing Chamber



Pugmill & Mixing Chamber

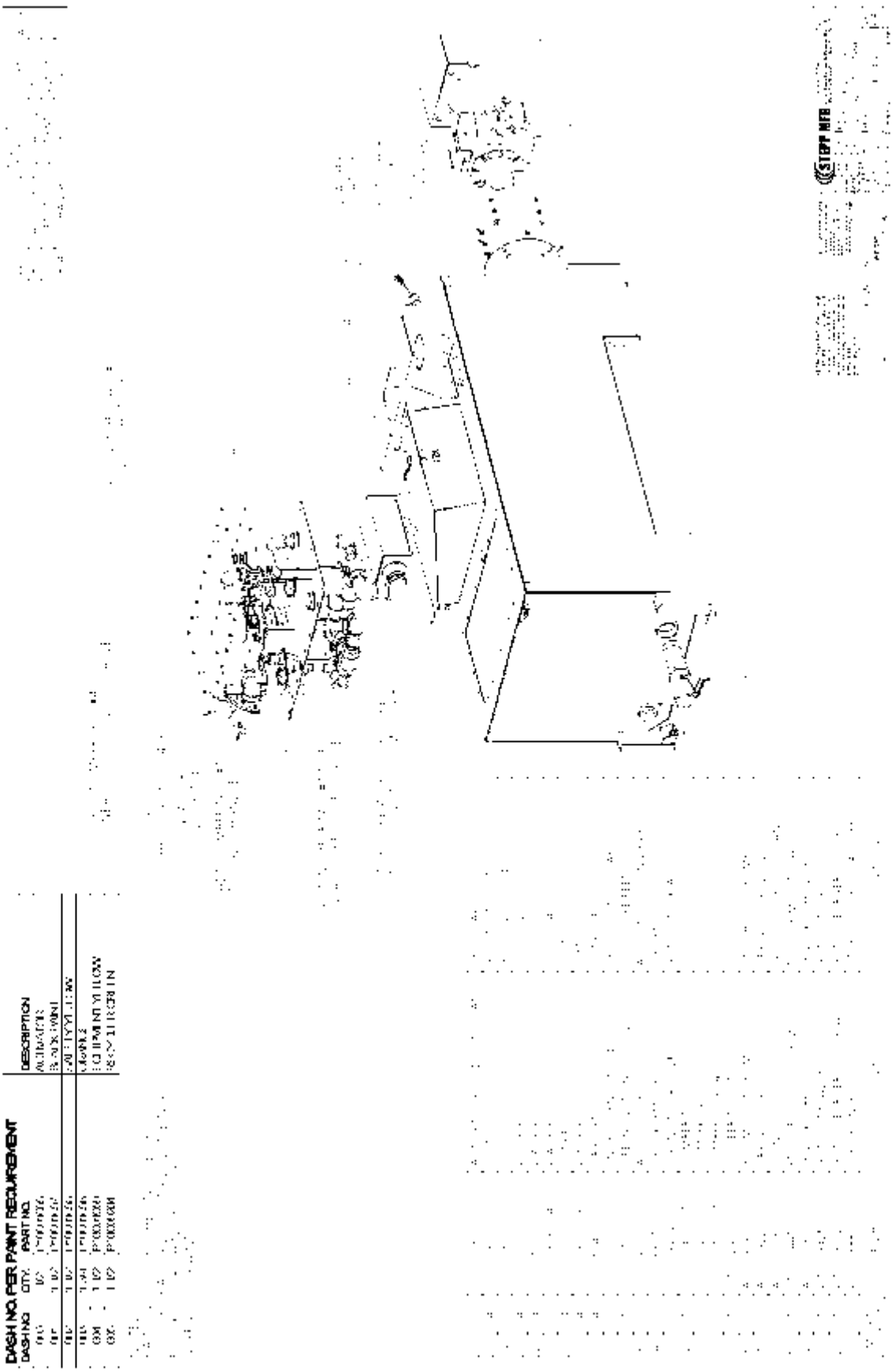


Pugmill & Mixing Chamber



Pugmill & Mixing Chamber

Oil Kettle and Pumping System



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-98	1	1-[illegible]	[illegible]
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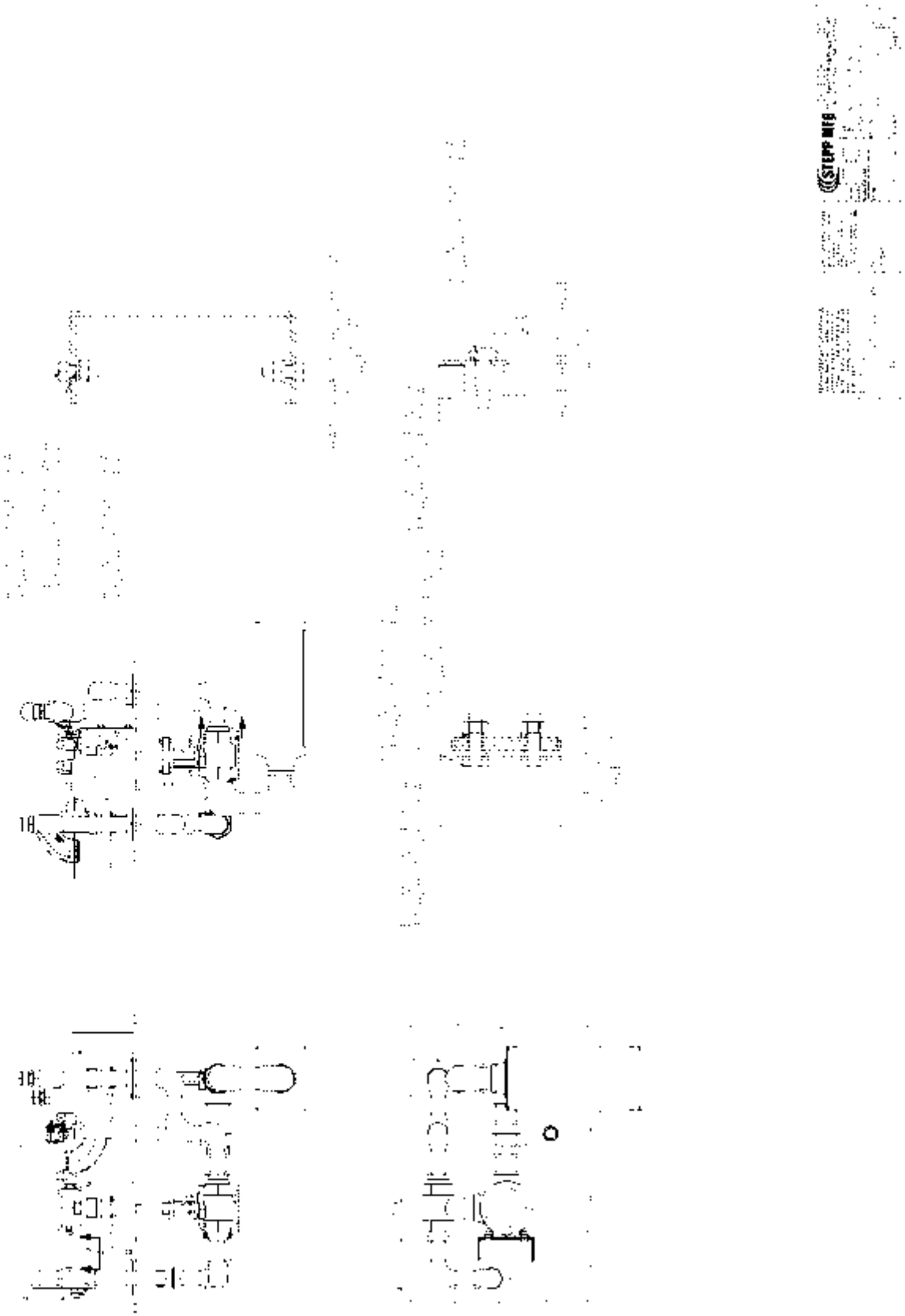
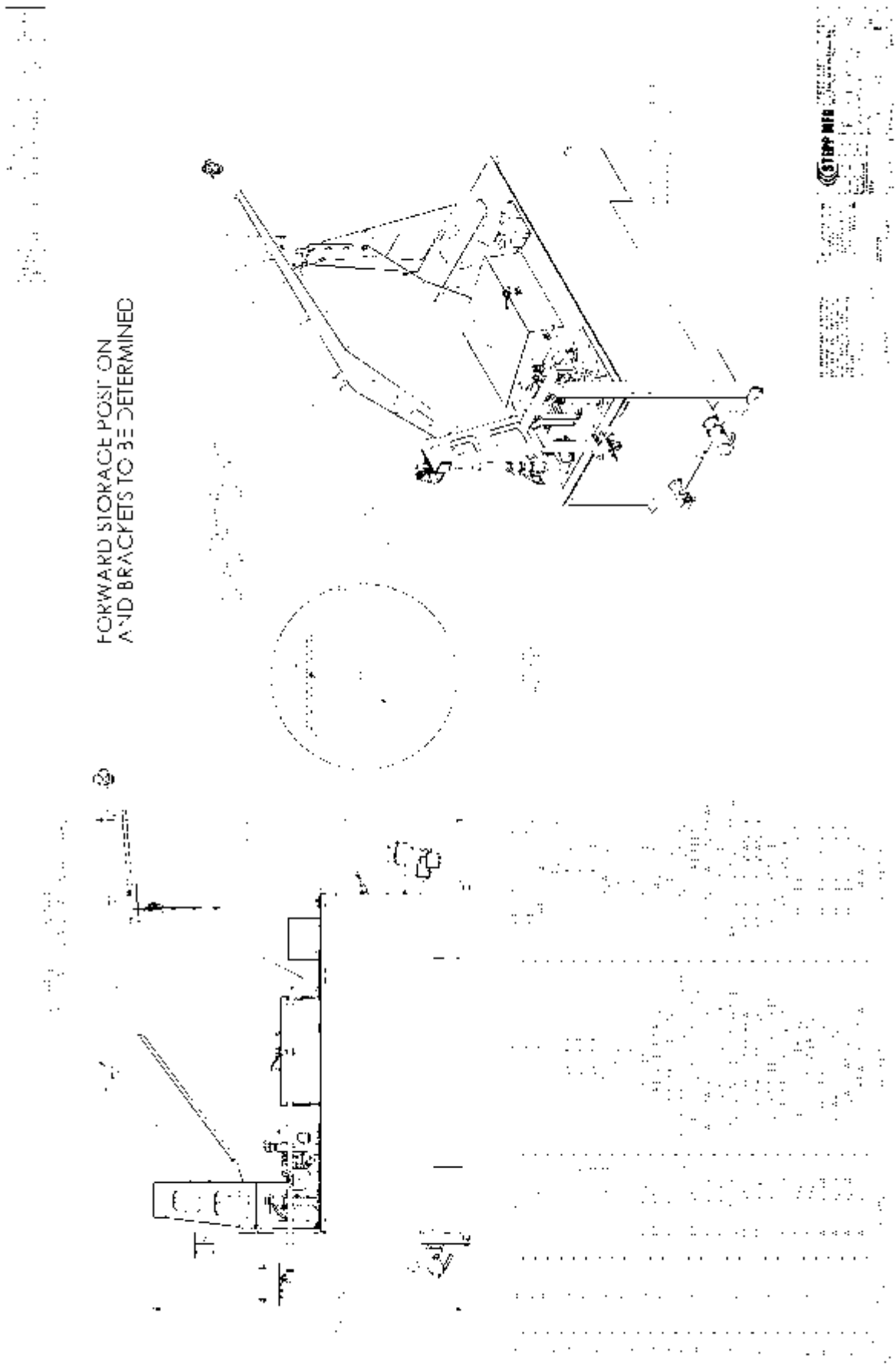
Oil Kettle and Pumping System

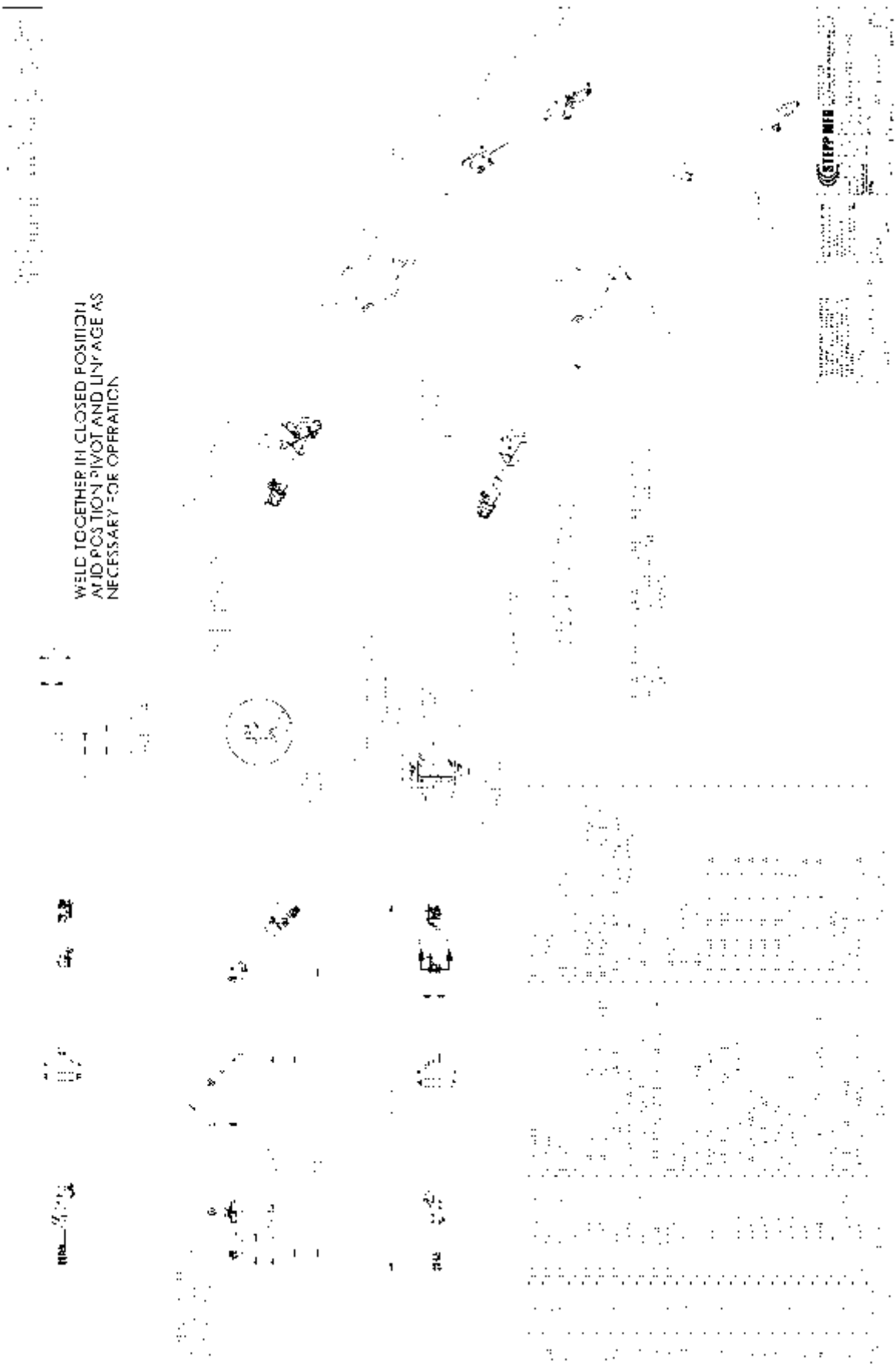
Oil Kettle and Pumping System

Oil Kettle and Pumping System

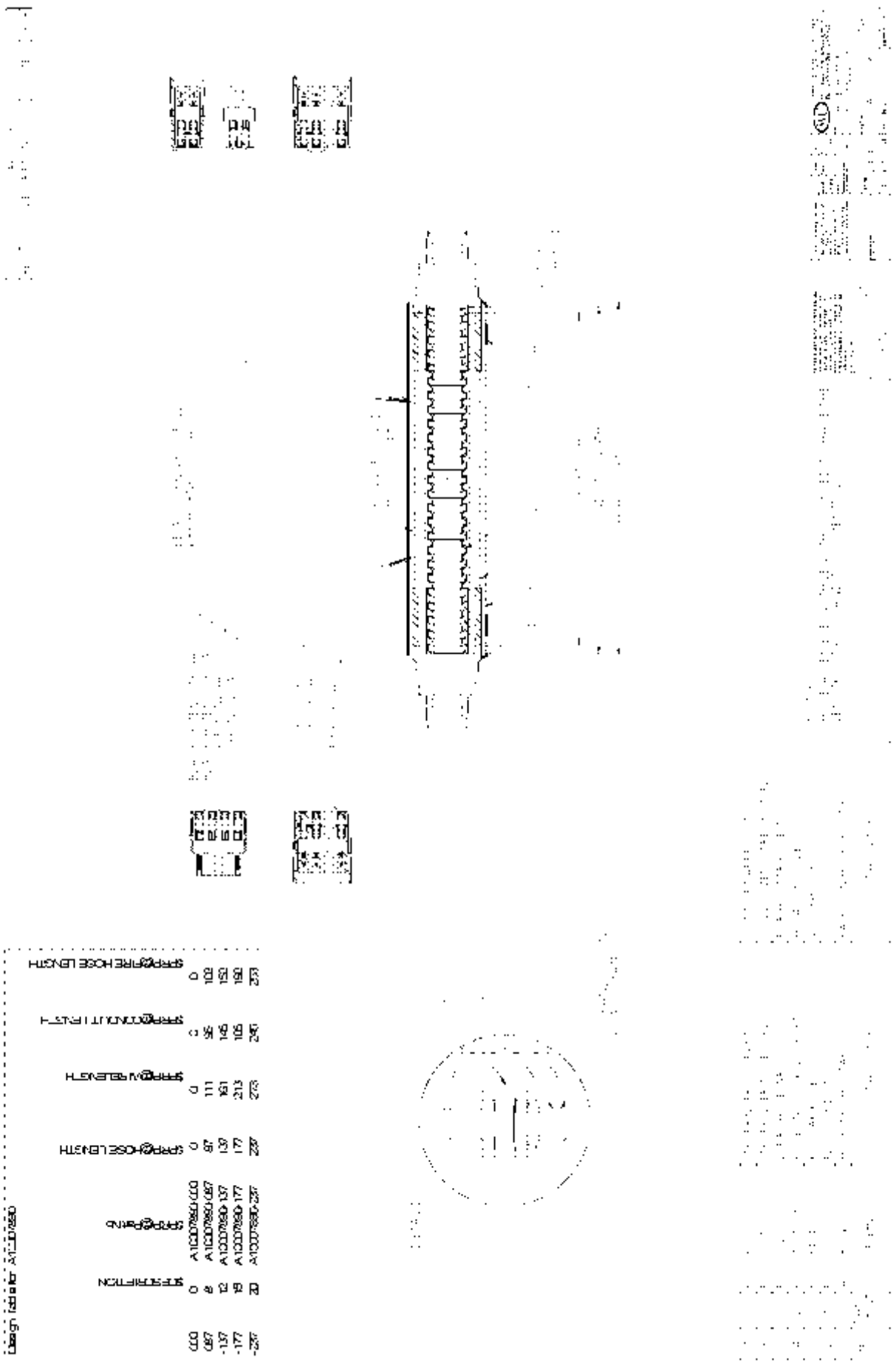


Heated and Non-Heated Overhead Boom

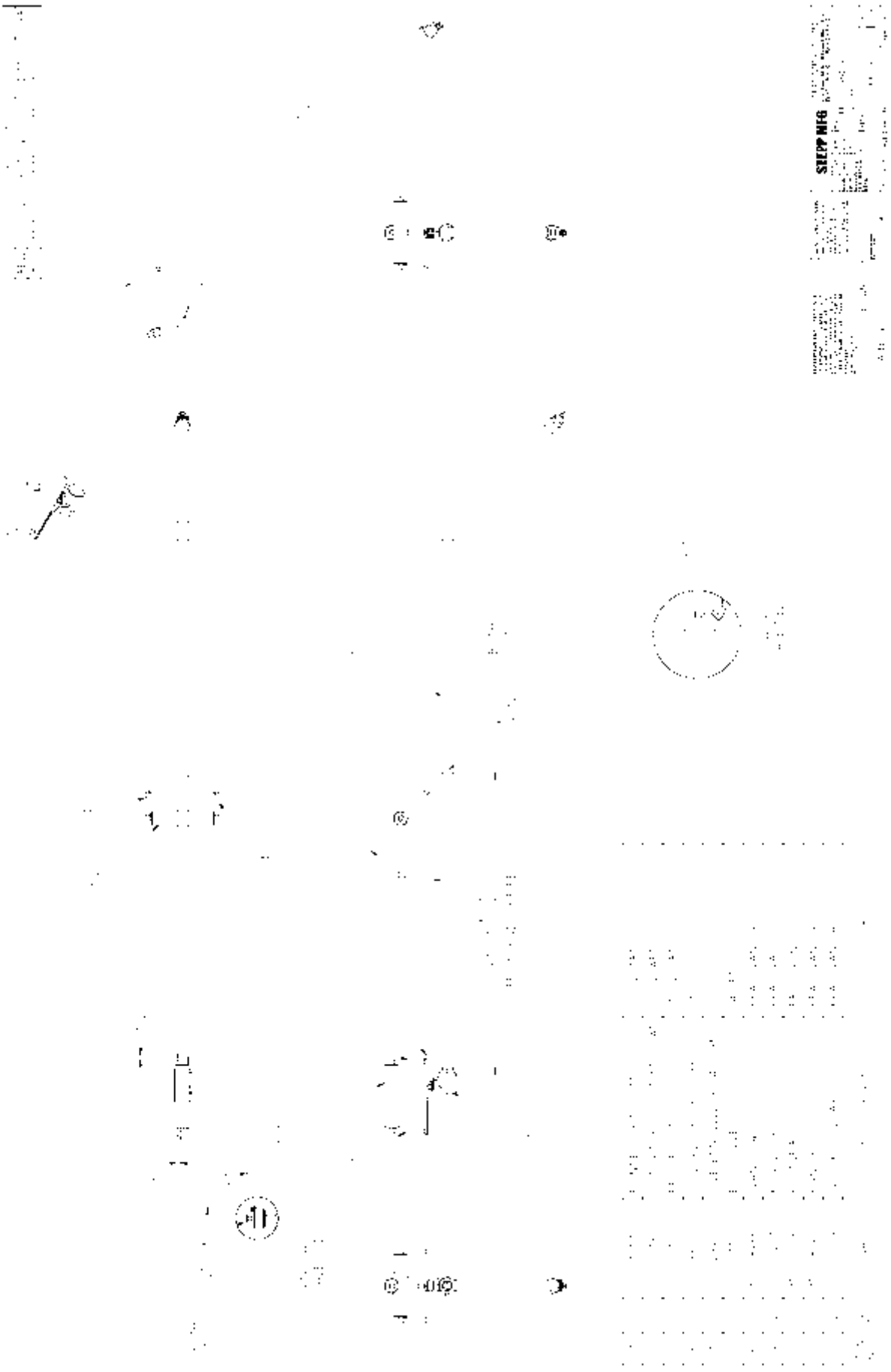


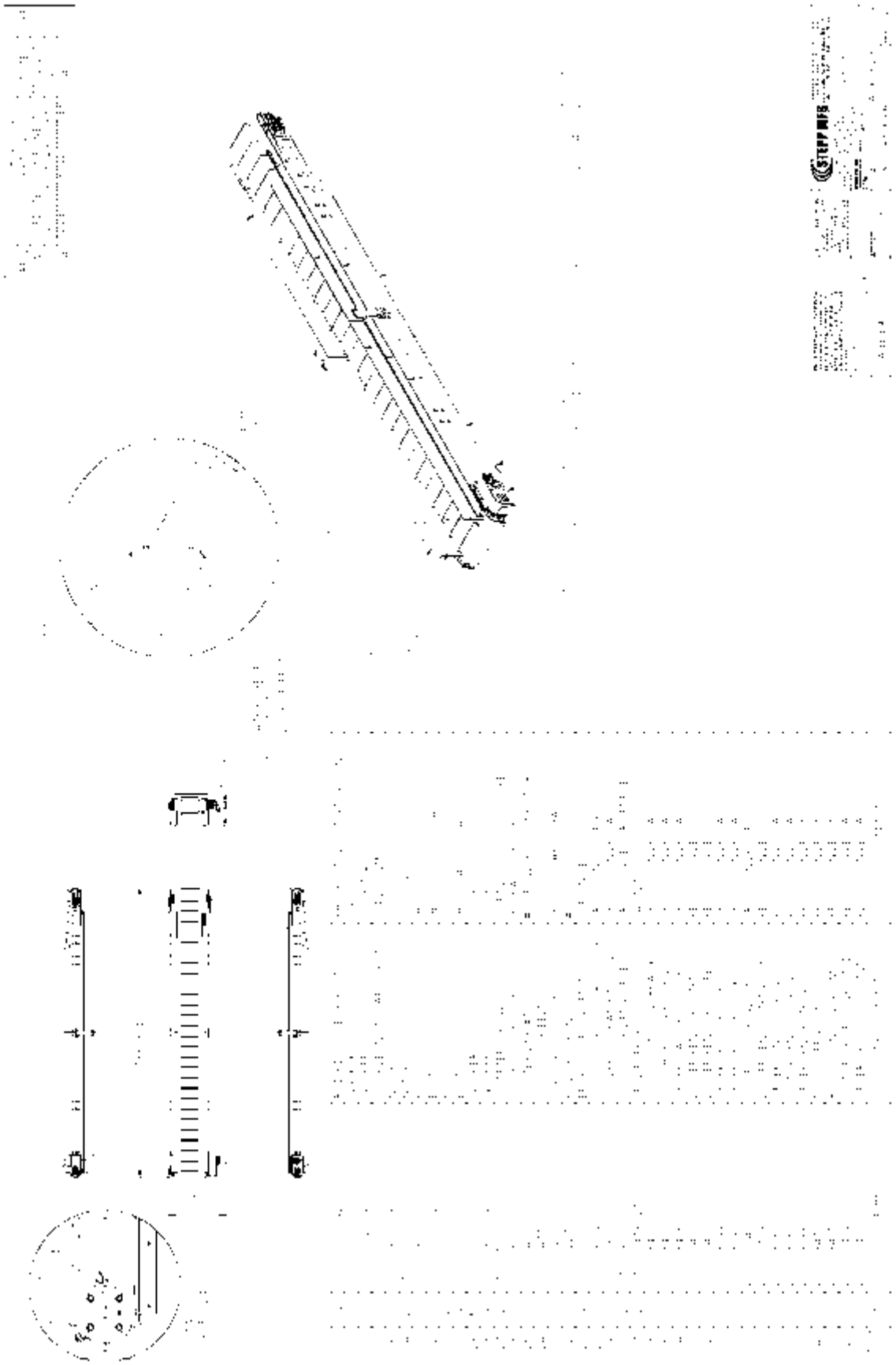

WELD TOGETHER IN CLOSED POSITION
AND POSITION PIVOT AND LINKAGE AS
NECESSARY FOR OPERATION

Heated Hose



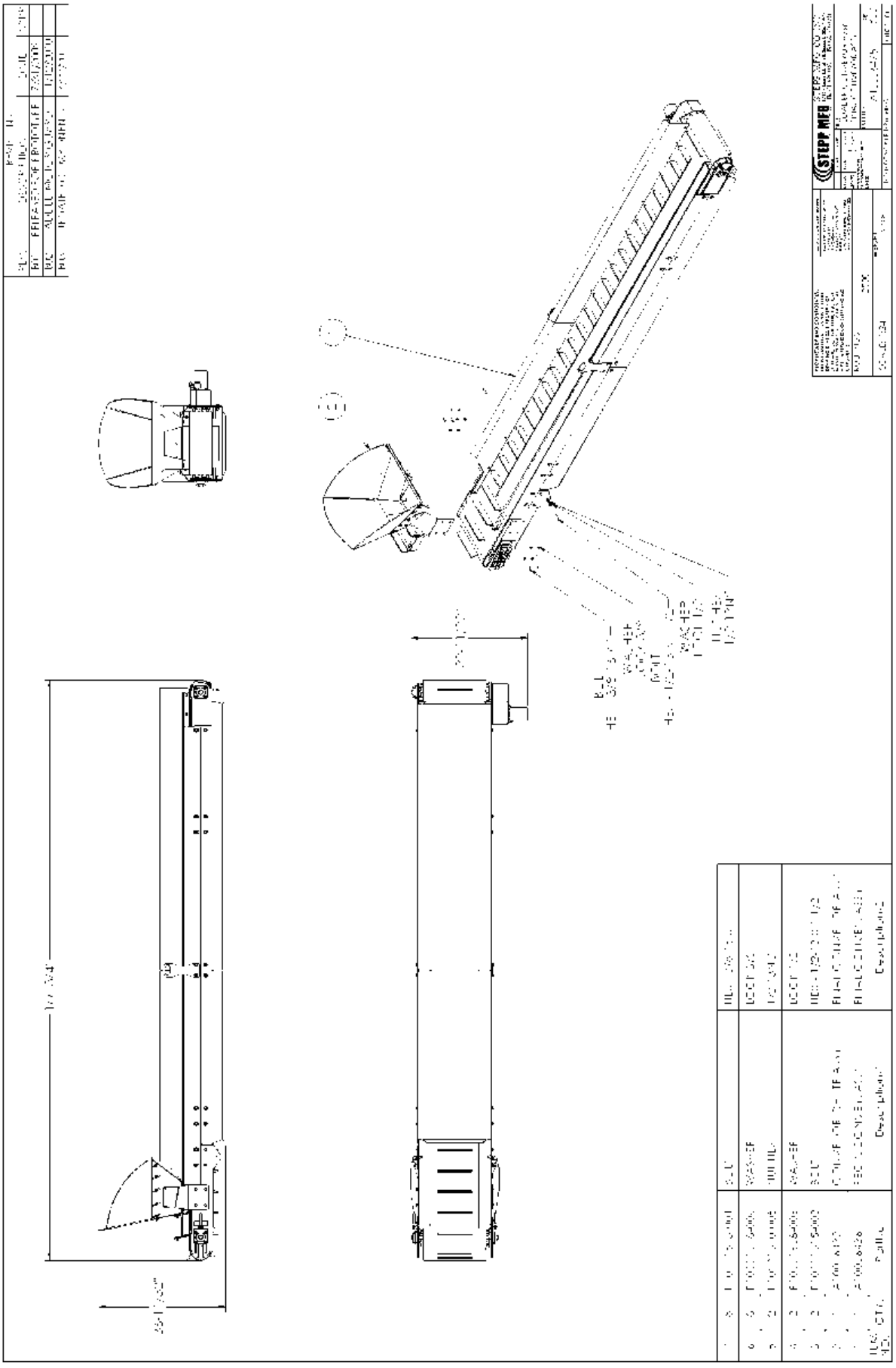
Non-Heated Spray Wand



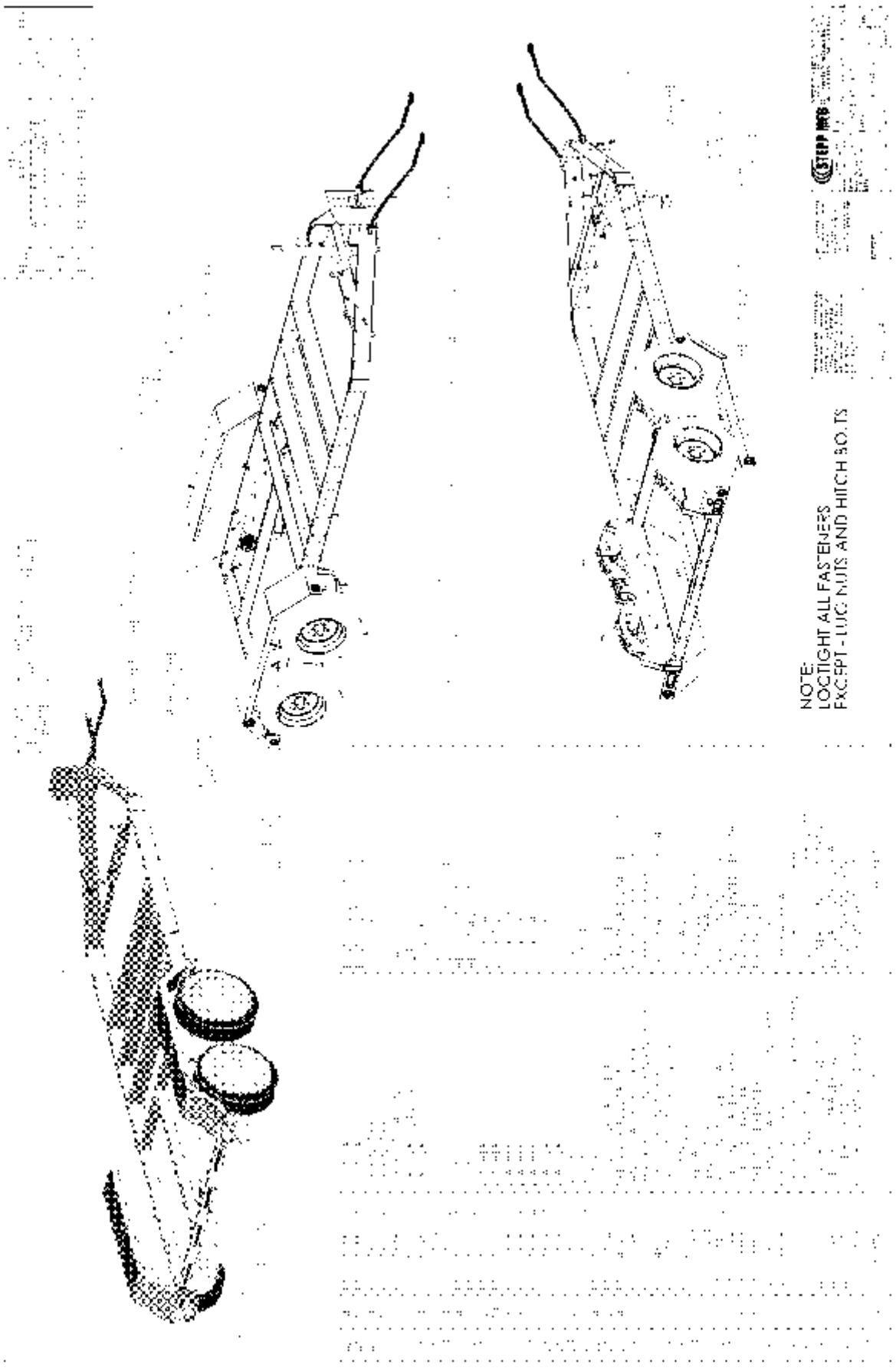


REPLACEMENT PARTS

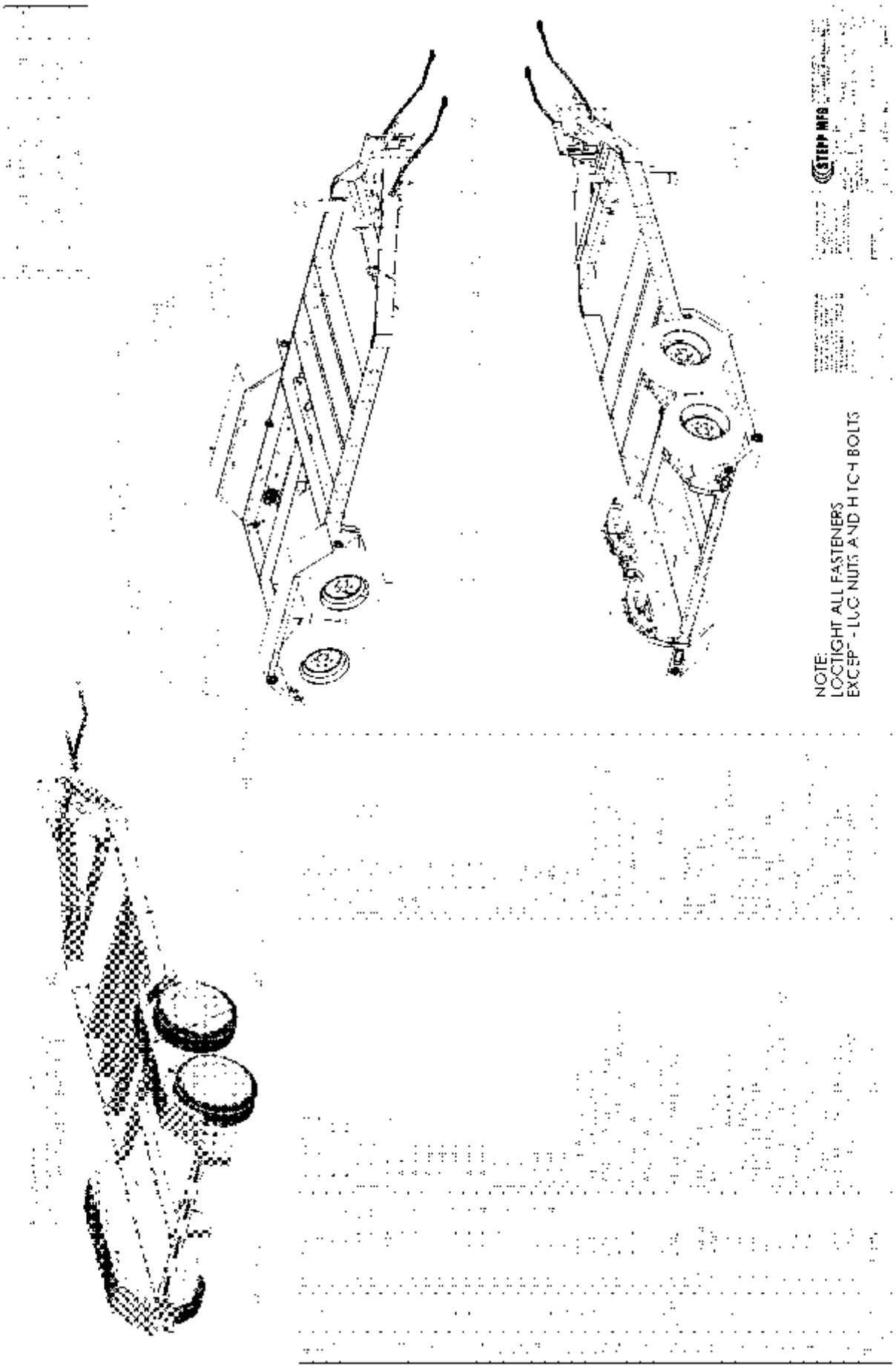
Conveyor

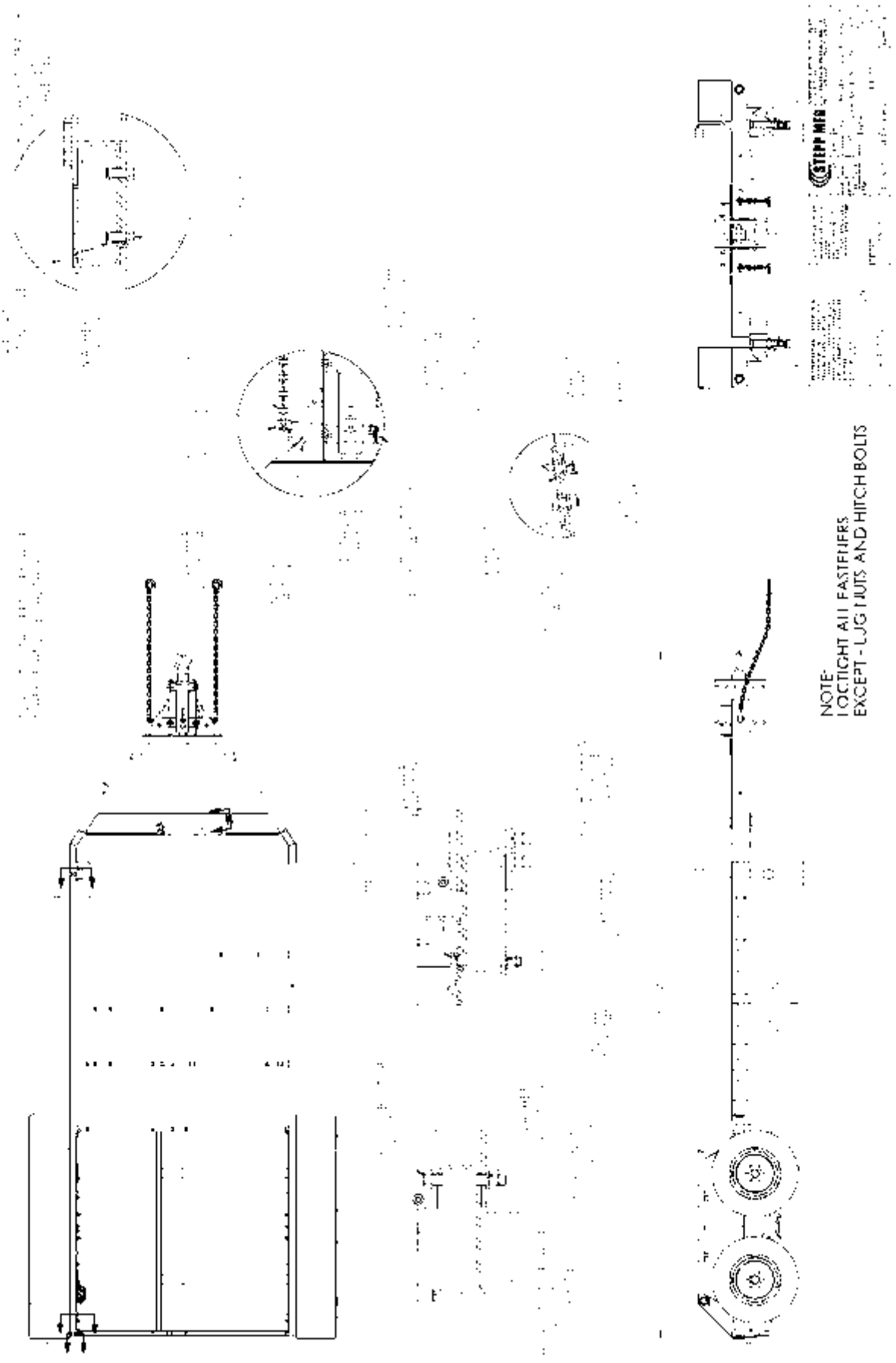


Trailer With Electric Brakes

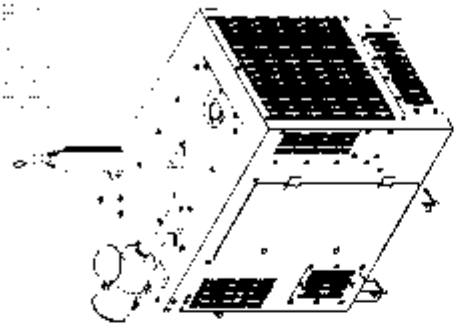


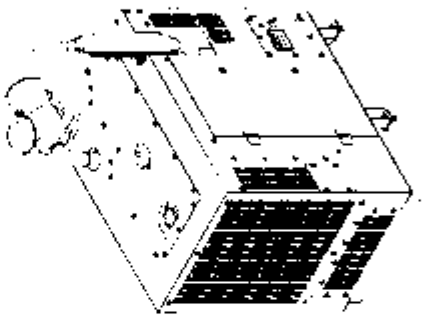
Trailer With Hydraulic Brakes

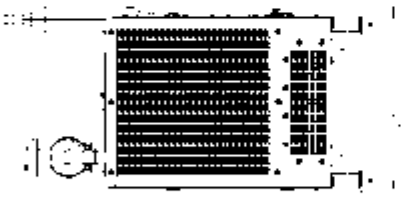


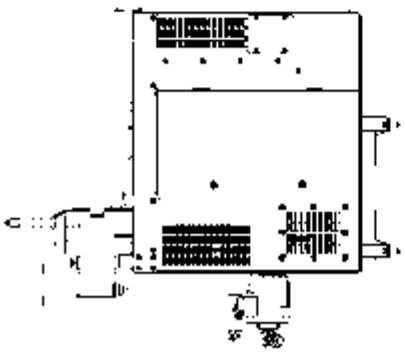

NOTE-
TORQUE ALL FASTENERS
EXCEPT - LUG NUTS AND HITCH BOLTS

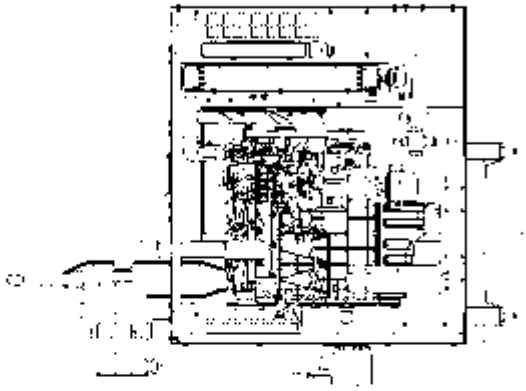

WIRE COLORS

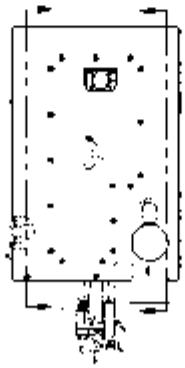


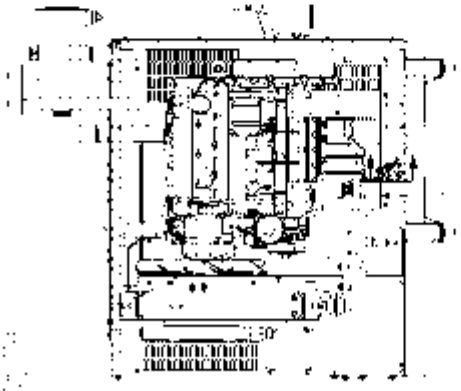


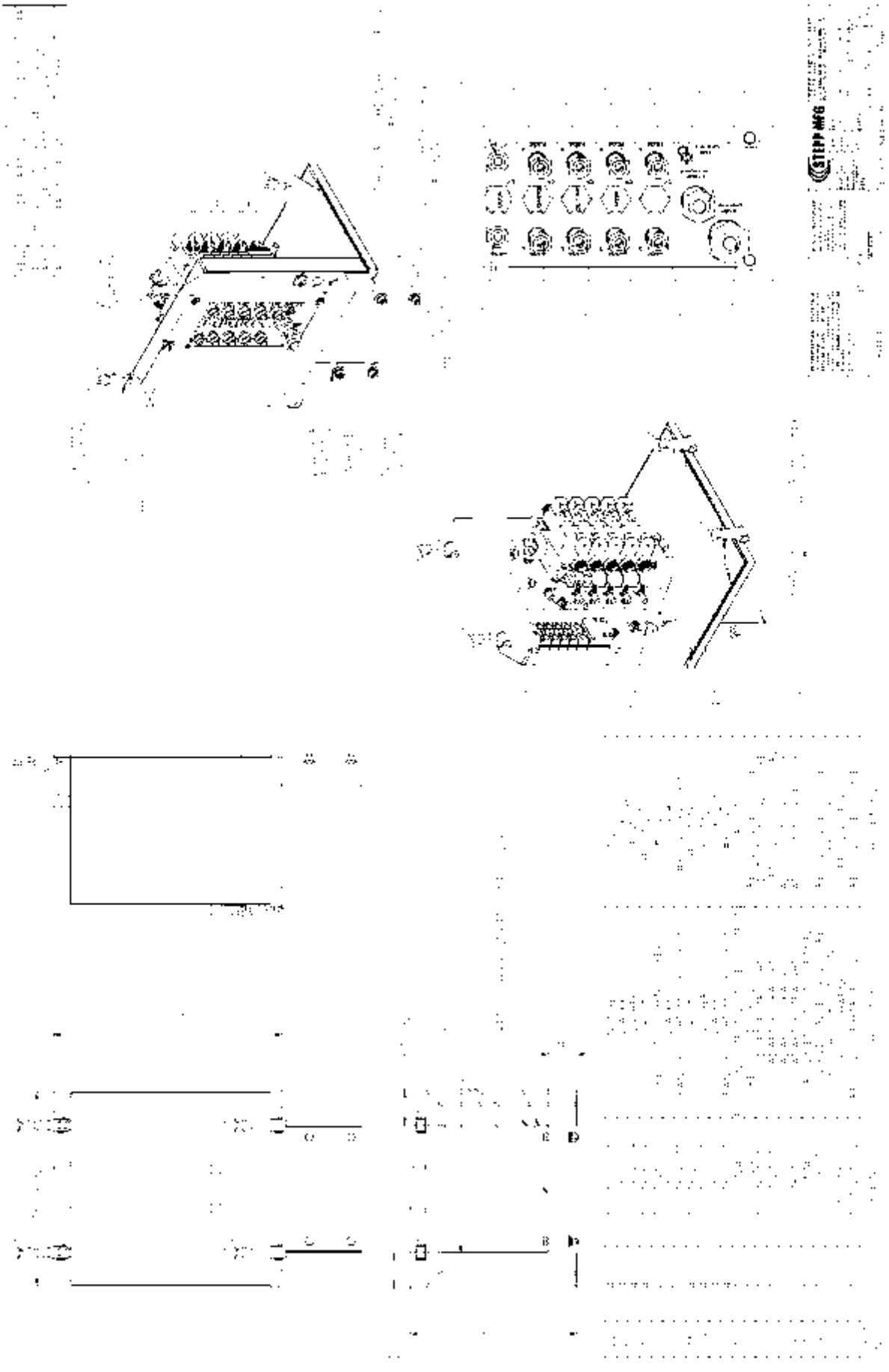


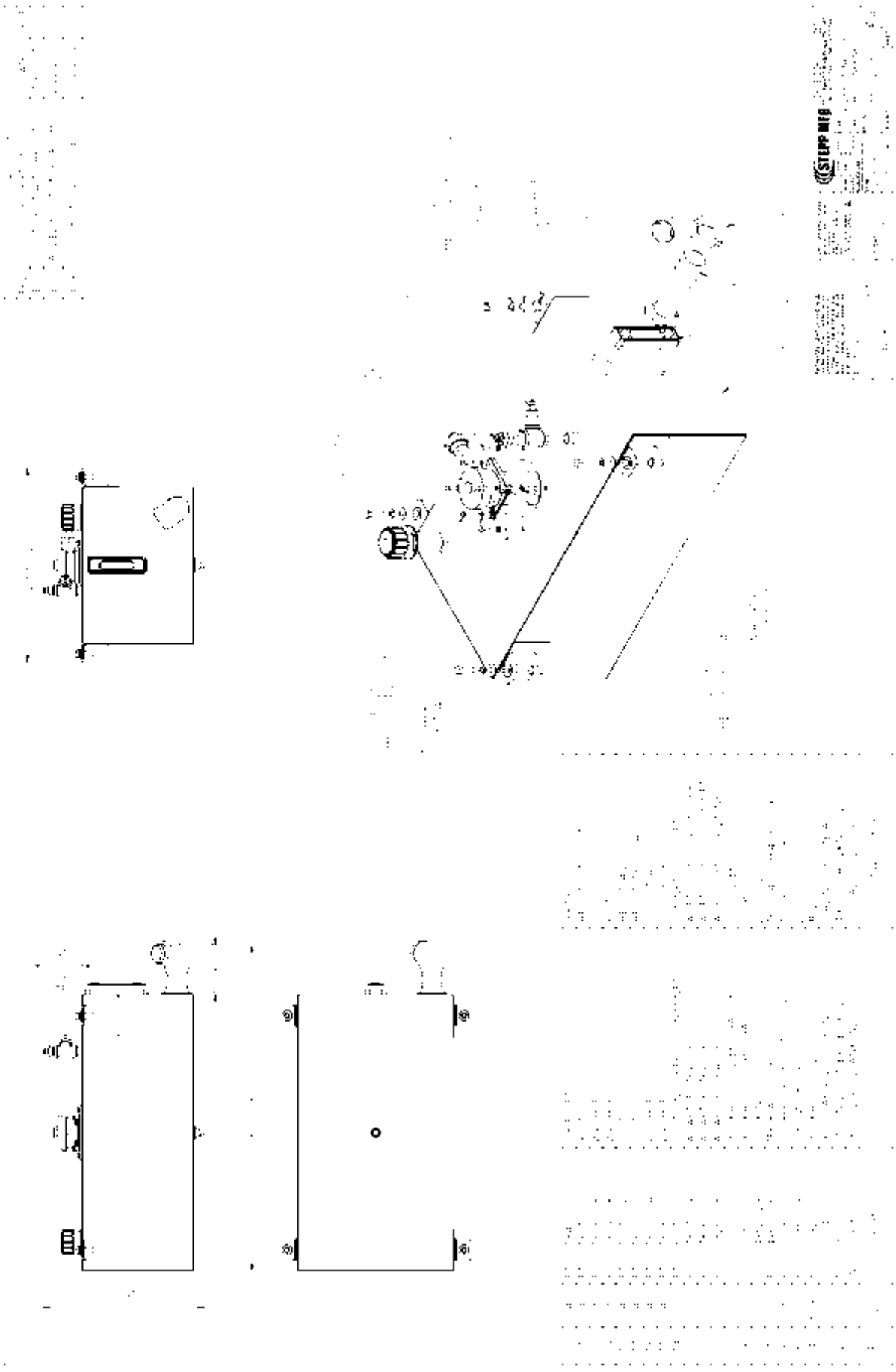


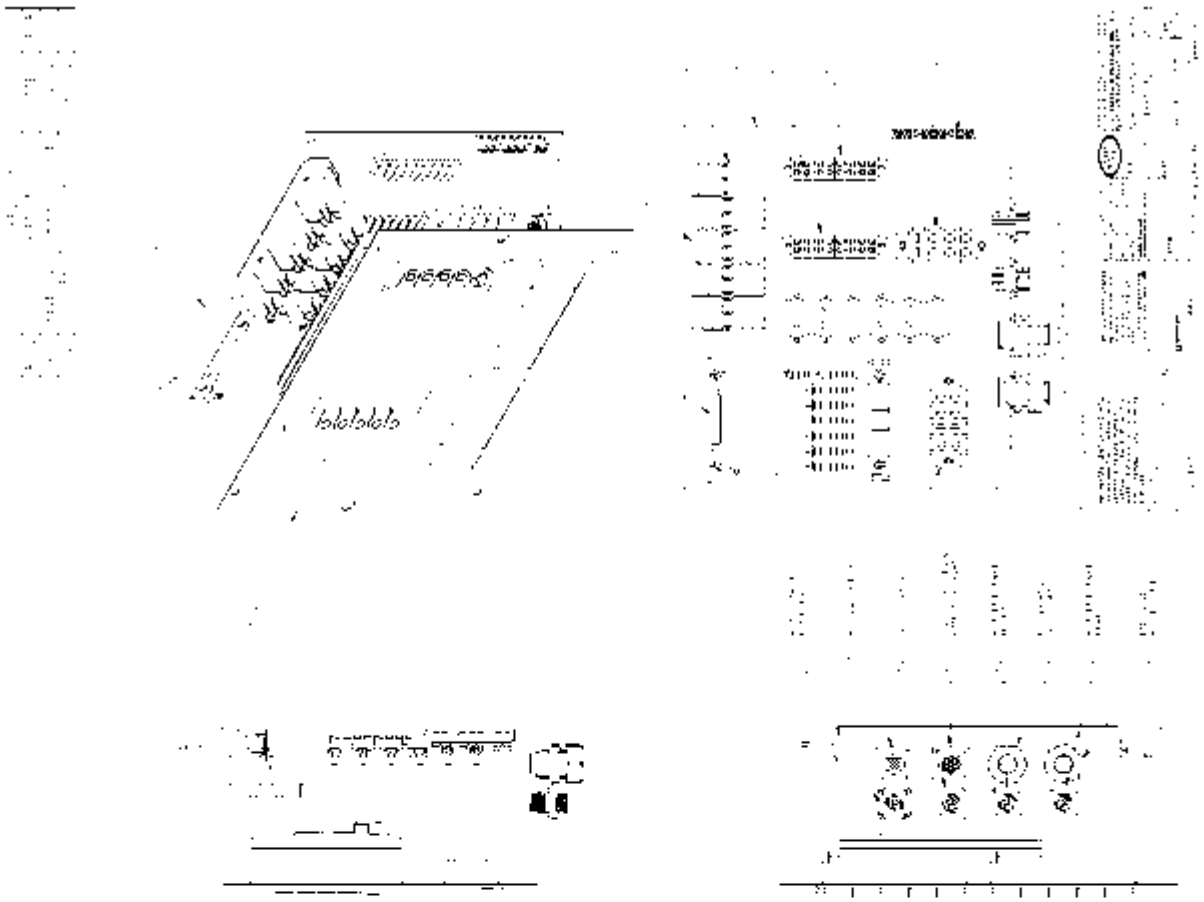


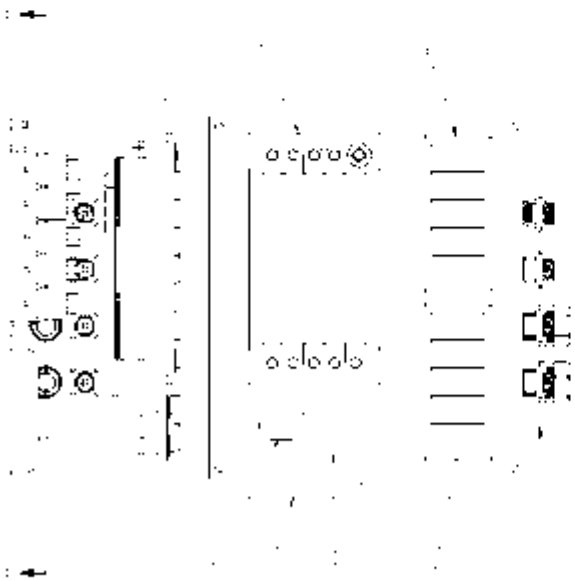


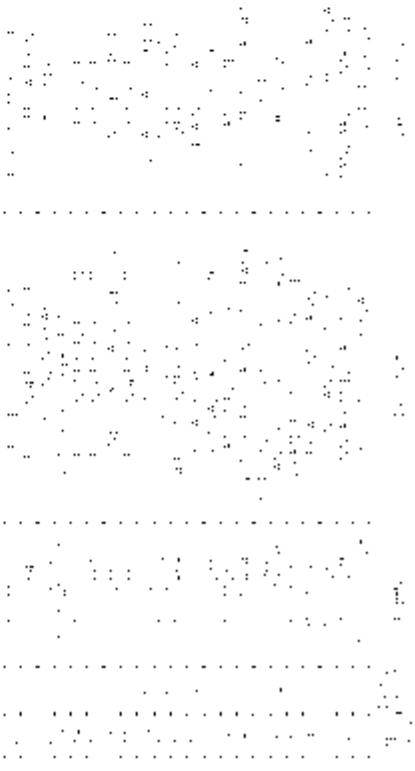


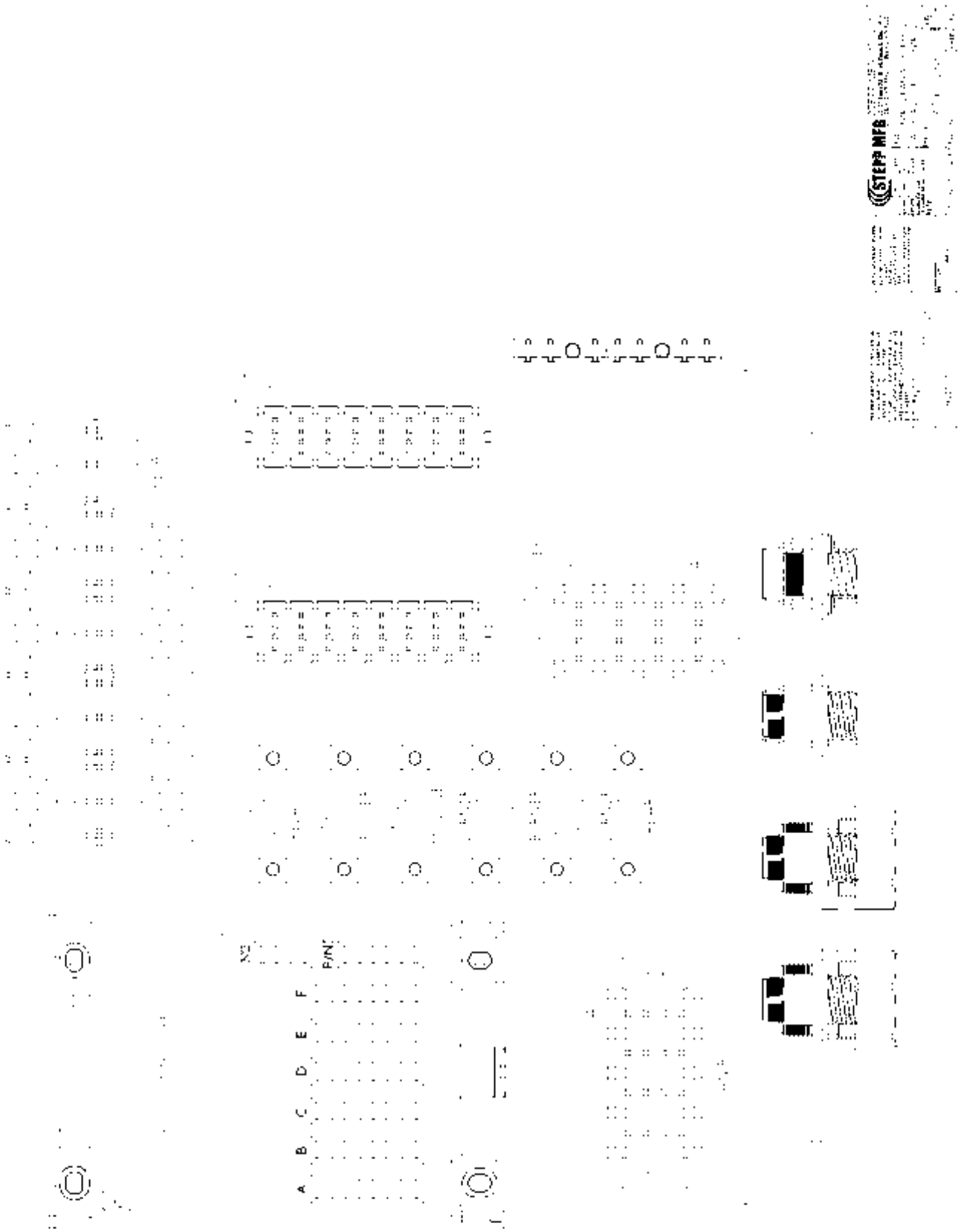












NOTE: DOCUMENT LENGTHS REQUIRED
ON PRINT AND RETURN TO ENGINEERING

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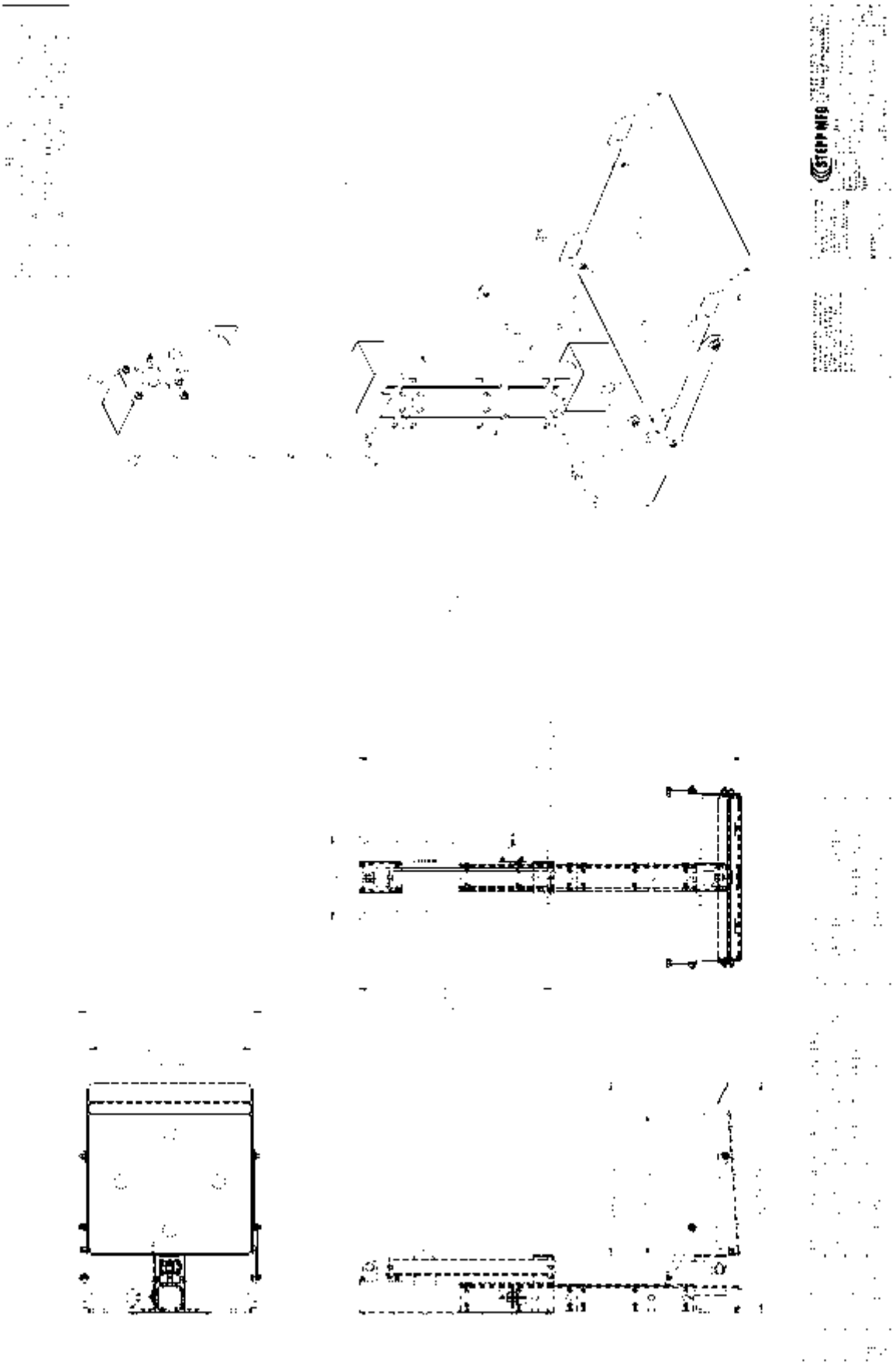
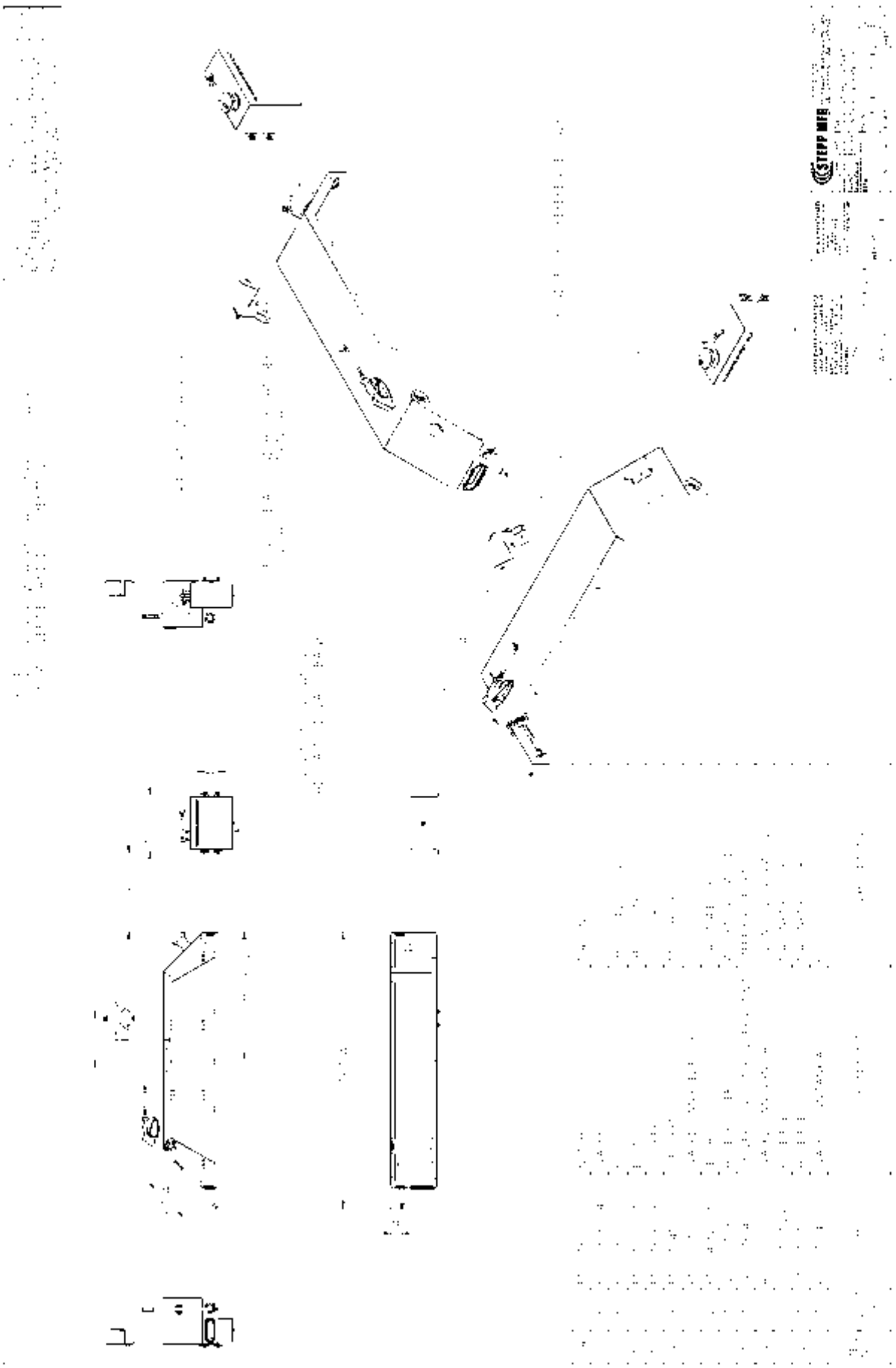
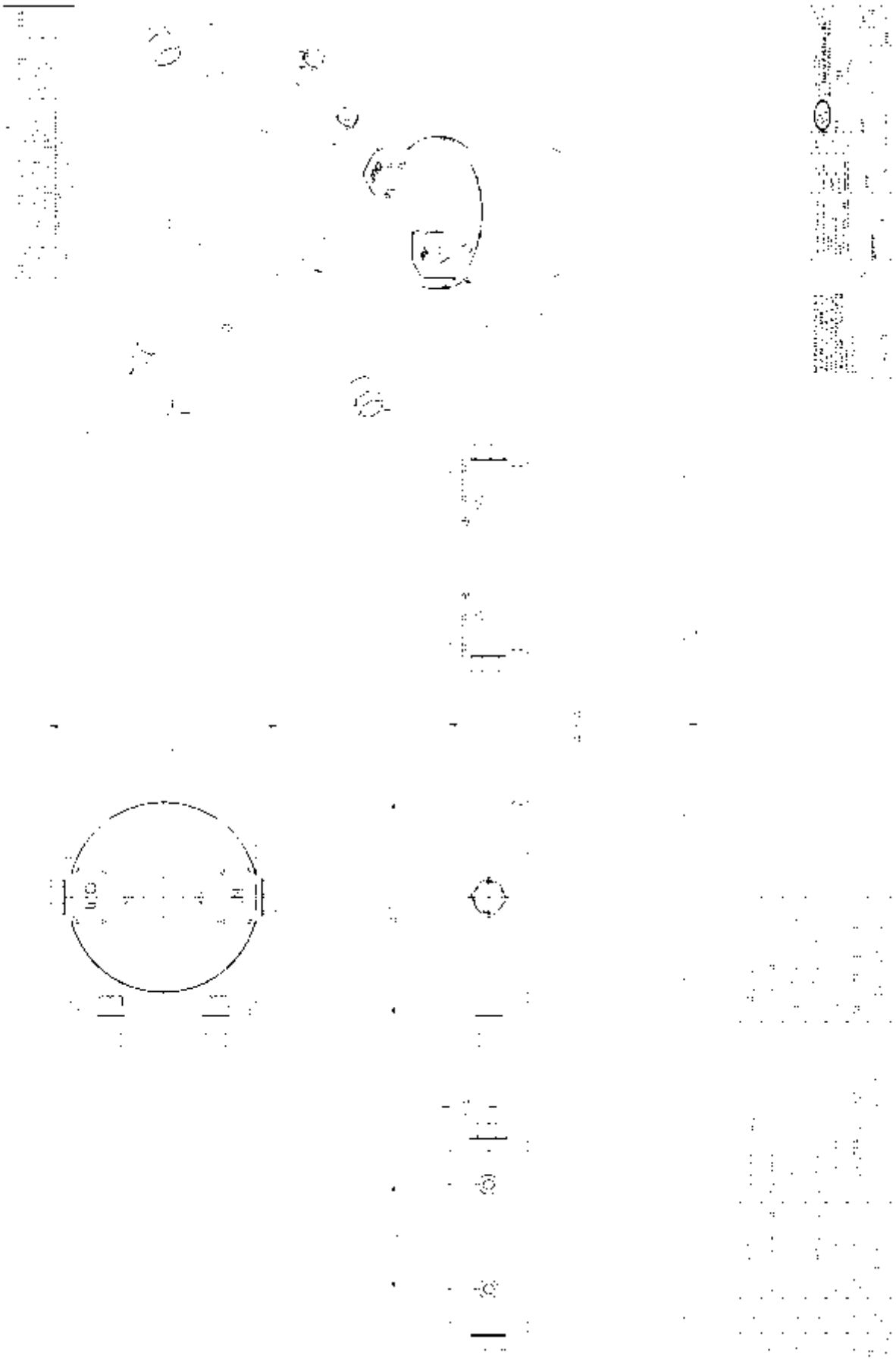
ON PRINT AND RETURN TO ENGINEERING

Compactor Plate Carrier

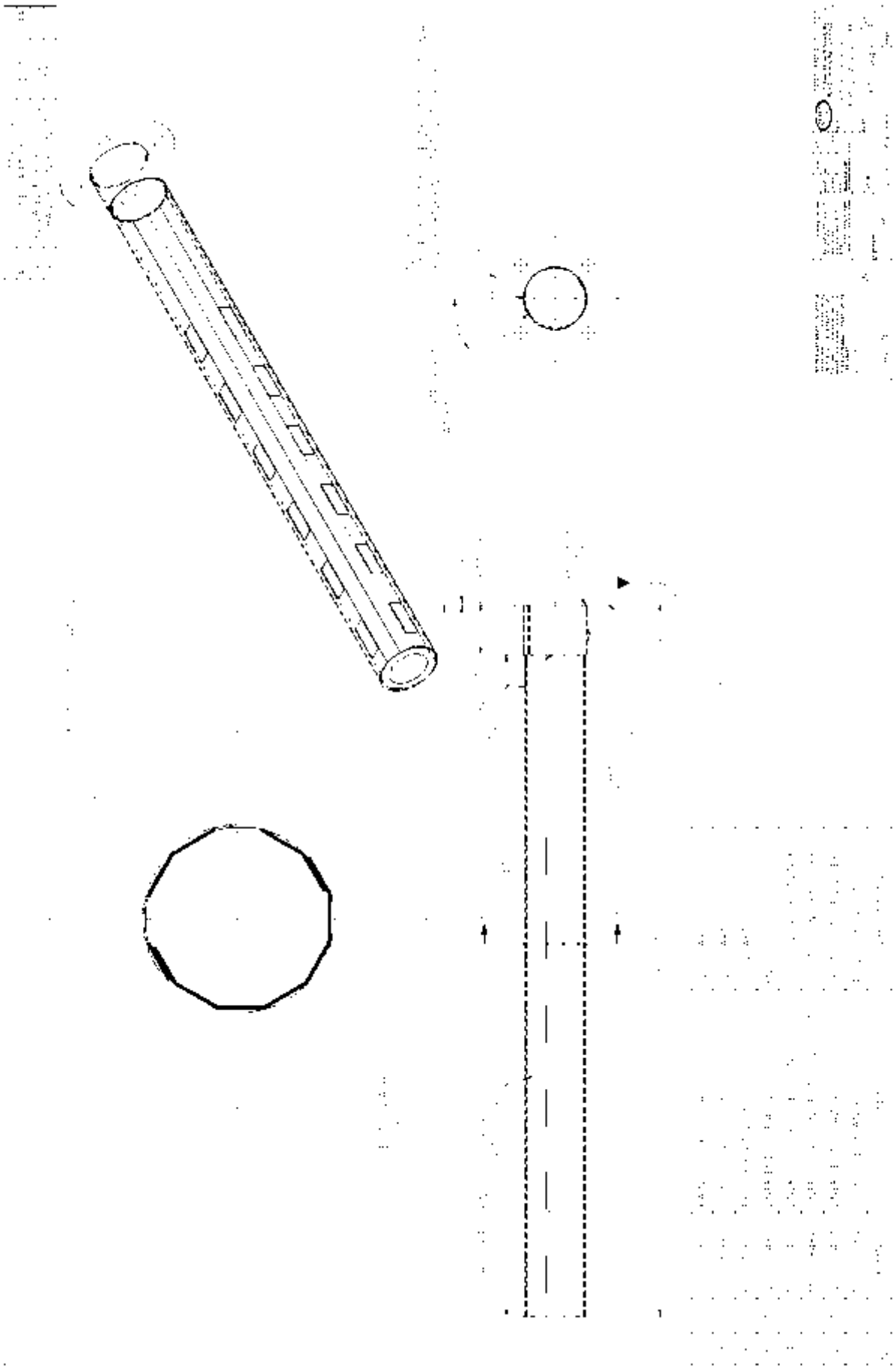


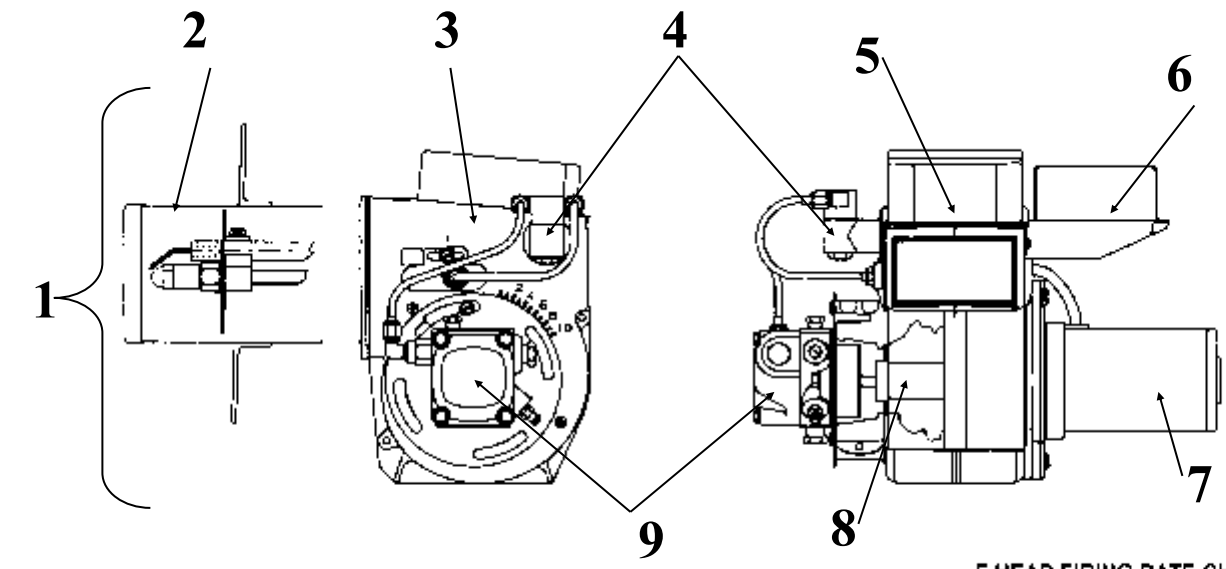


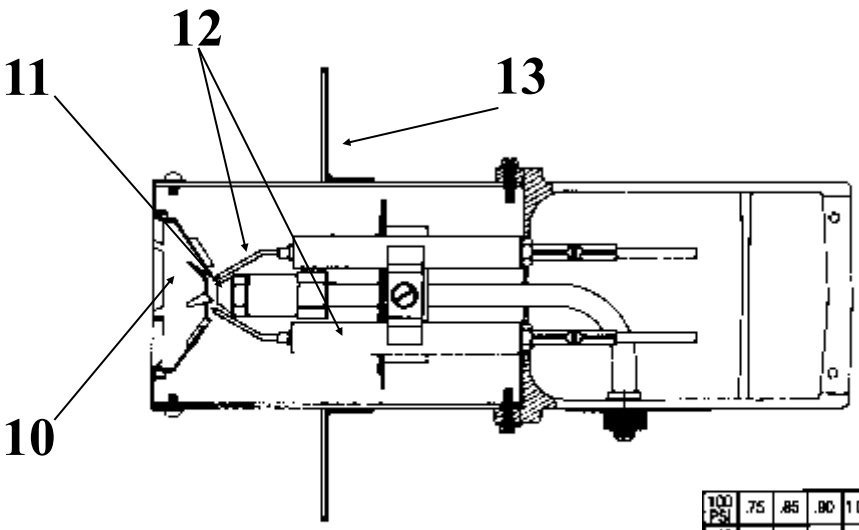
Fuel Filter



Burner Liner







F HEAD FIRING RATE CHART

HEAD	F-3	F-8	F-12	F-22	F-31
MIN. FIRING RATE	.75	1.25	1.65	1.75	2.50
MAX. FIRING RATE	1.25	1.65	2.00	2.50	3.00

NOZZLE FLOW CHART

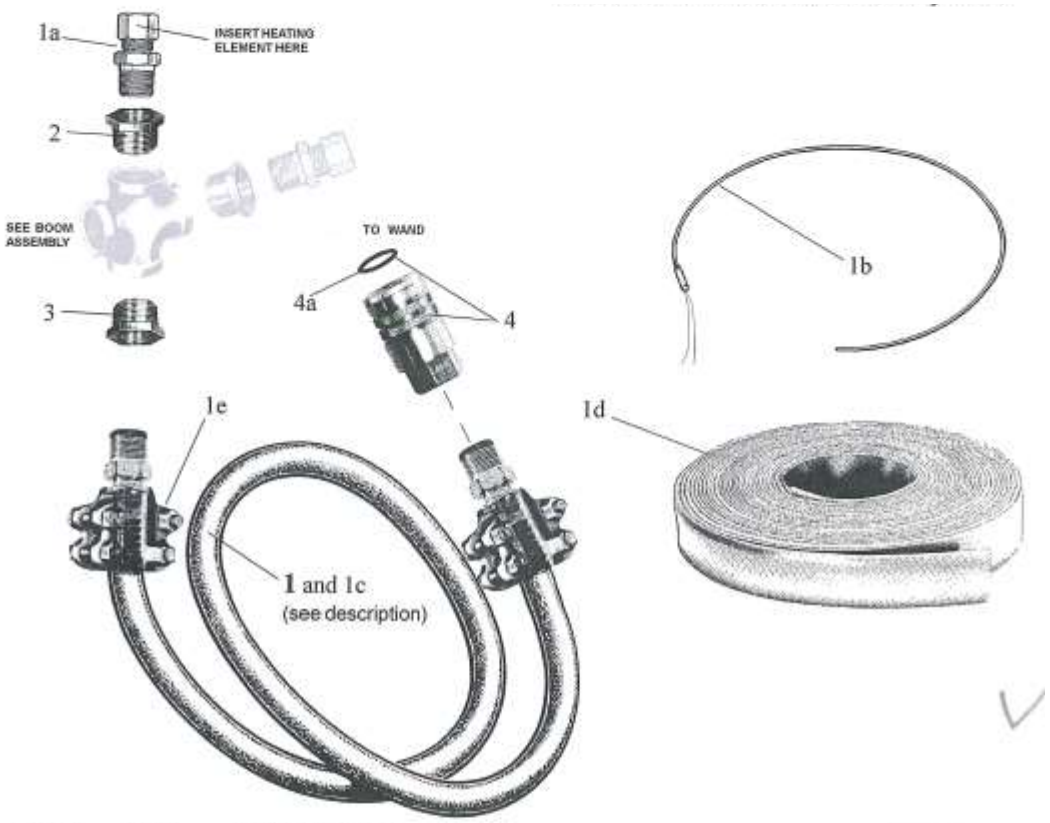
100 PSI	.75	.85	.90	1.00	1.10	1.20	1.25	1.35	1.50	1.65	1.75	2.00	2.25	2.50	2.75	3.00
140 PSI	.89	1.00	1.07	1.18	1.30	1.41	1.48	1.60	1.78	1.95	2.07	2.37	2.65	2.96	3.25	3.55

ITEM	QTY	DESCRIPTION	PART#
1	1	Burner, fuel oil, Beckett Assembly	A10008105-011
2	1	Air Tube	509070
3	1	Photo electric eye w/connectors (under ignition transformer)	A10007678
4	1	Valve, fuel control	509091
5	1	Ignition Transformer	509087
6	1	Primary Controller	A10008216
7	1	Motor, fan and pump	509092
8	1	Coupling, pump to motor	509086
9	1	Pump, burner fuel	509094
10	1	Fuel retention head, F31	P10005130
11	1	Nozzle, .3.0 GPM	P10005133
12	1	Electrode kit, igniter	509089
13	1	Mounting Flange	509071
**	1	Brush kit, motor	509072
**	1	Fuel Filter Element	509078

** Not Shown

Note: Nozzle GPH rated at 100 psi.

8'/12' Heated Hose



ITEM	QTY	DESCRIPTION	PART #
1	1	8' Hose Assembly with heating element	523089
	1	12' Hose Assembly with heating element	523093
1a	1	Compression Fitting 3/8"	M10009910
1b	1	8' Heating element, for hose, includes **connector	A10009933
	1	12' Heating element, for hose, includes **connector	A10009934
1c	1	8' Hose Assembly, less heating element	A10007890-087
	1	12' Hose Assembly, less heating element	A10007890-137
1d	AR	Safety Jacket, specify length	P10008320
1e	2	Clamp assembly	523087
**	1	Wire Harness & Connectors (in hose jacket)	see next pg.
2	1	Bushing, reducing	P10004952-009
3	1	Bushing, reducing	P10004952-011
4	1	Quick Coupling, female	P10009965
4a	1	Seal, quick coupling	509999
**	1	1/2" Compression Fitting (for 15', 20' hoses, & 62" elements)	M10011276

** - Not Shown

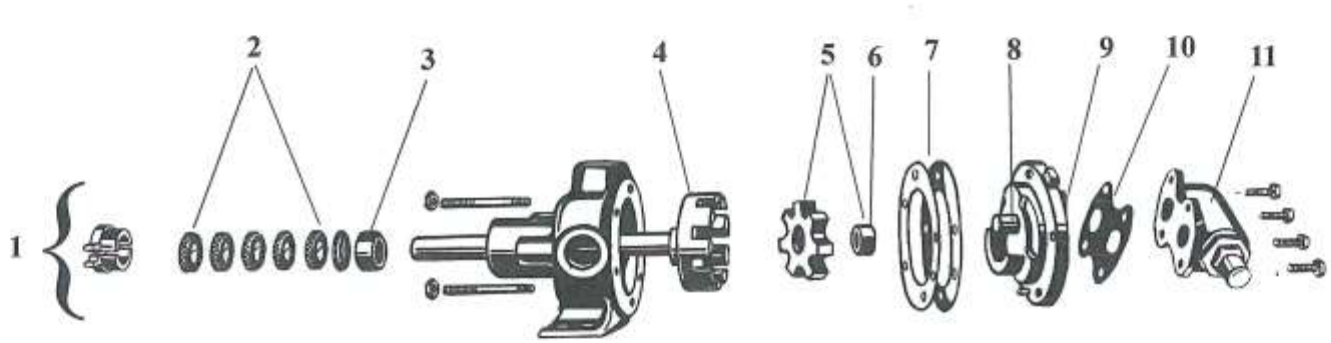
Indented item numbers with a letter suffix are included with preceding item number.

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.

Ortec Hose

ITEM	QTY	DESCRIPTION	PART #
-	1	Hose, yellow ortec, 1/2" x 20 ft. (with fittings)	523055
-	1	Hose, yellow ortec, 1/2" x 25 ft. (with fittings)	523006
-	1	Hose, yellow ortec, 1/2" x 40 ft. (with fittings)	523021
-	1	Hose, yellow ortec, 1/2" bulk per foot (no fittings)	P10007809
-	1	Hose, yellow ortec, 3/4" x 15 ft. (with fittings)	523007
-	1	Hose, yellow ortec, 3/4" x 20 ft. (with fittings)	523054
-	1	Hose, yellow ortec, 3/4" x 25 ft. (with fittings)	523075
-		Hose, yellow ortec, 3/4" bulk per foot (no fittings)	P10007810
-	1	Hose, yellow ortec, 1" x 15 ft. (with fittings)	523008
-	1	Hose, yellow ortec, 1" x 20 ft. (with fittings)	523015
-	1	Hose, yellow ortec, 1" x 25 ft. (with fittings)	523010
-		Hose, yellow ortec, 1" bulk per foot (no fittings)	P10007811

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.



ITEM	QTY	DESCRIPTION	PART#
1	1	Pump, complete with relief valve	515006
	1	Pump, complete without relief valve, with steel rotor (OJK-50, 75, 120)	515063
	1	Pump, complete without relief valve, with standard rotor	515005
2	5	Packing seal, shaft	515019
3	1	Bushing, bracket	515041
4	1	Rotor and Shaft	515031
5	1	Idler with bushing	515015
6	1	Bushing	515053
7	1	Gasket set, head - (for setting end clearance)	515016
8	1	Idler Pin	515052
9	1	Head, for pumps without relief valve (includes # 7)	515028
	1	Head, for pumps with relief valve (includes # 7)	515027
10	1	Gasket, relief valve	515083
11	1	Relief Valve	515055

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.

Spray Nozzles
For Spray Bars and Spray Wands

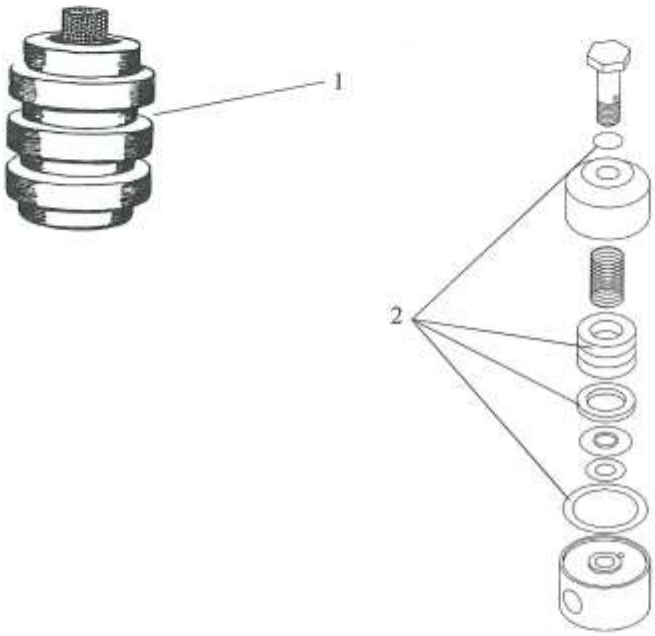
ITEM	QTY	DESCRIPTION	PART #
1	-	Nozzle, Duckbill, 2½" Elkhart #184	P-160
2	-	V-Jet Nozzle, H¼VV9508 (for spray wands)	P10002943
3	-	V-Jet Nozzle, H¼U4070 (for spray bars)	520088
	-	V-Jet Nozzle, H¼U6515 (for spray bars)	P10002944
	-	V-Jet Nozzle, H¼U6520 (for spray bars)	P10005342
	-	V-Jet Nozzle, H¼U6530 (for spray bars)	P10005343
	-	V-Jet Nozzle, H¼U6540 (for spray bars)	P10005340
	-	V-Jet Nozzle, H¼U6550 (for spray bars)	P10005345
	-	V-Jet Nozzle, H¼U6560 (for spray bars)	P10005346
	-	V-Jet Nozzle, H¼U6570 (for spray bars)	P10005347
	-	V-Jet Nozzle, H3/8U65100 (for spray bars)	520042
4	-	Duck Bill Nozzle Assy.	A10010564

Example: H ¼ U 65 50

NPT Size — Spray Angle — Orifice Size (larger number = larger size)

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.

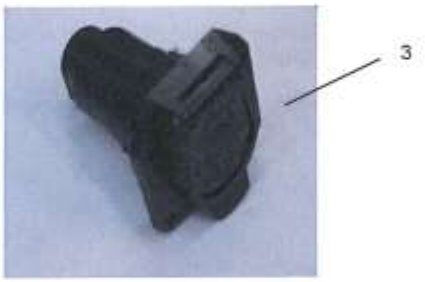
Burner Filters
For Diesel Burner and LP Systems

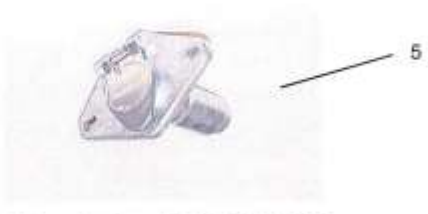


ITEM	QTY	DESCRIPTION	PART #
1	1	Fuel Filter Element, Diesel Burner (includes gaskets)	509078
2	1	LP Fuel Filter Element, LP Burners (includes gaskets)	509028

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.

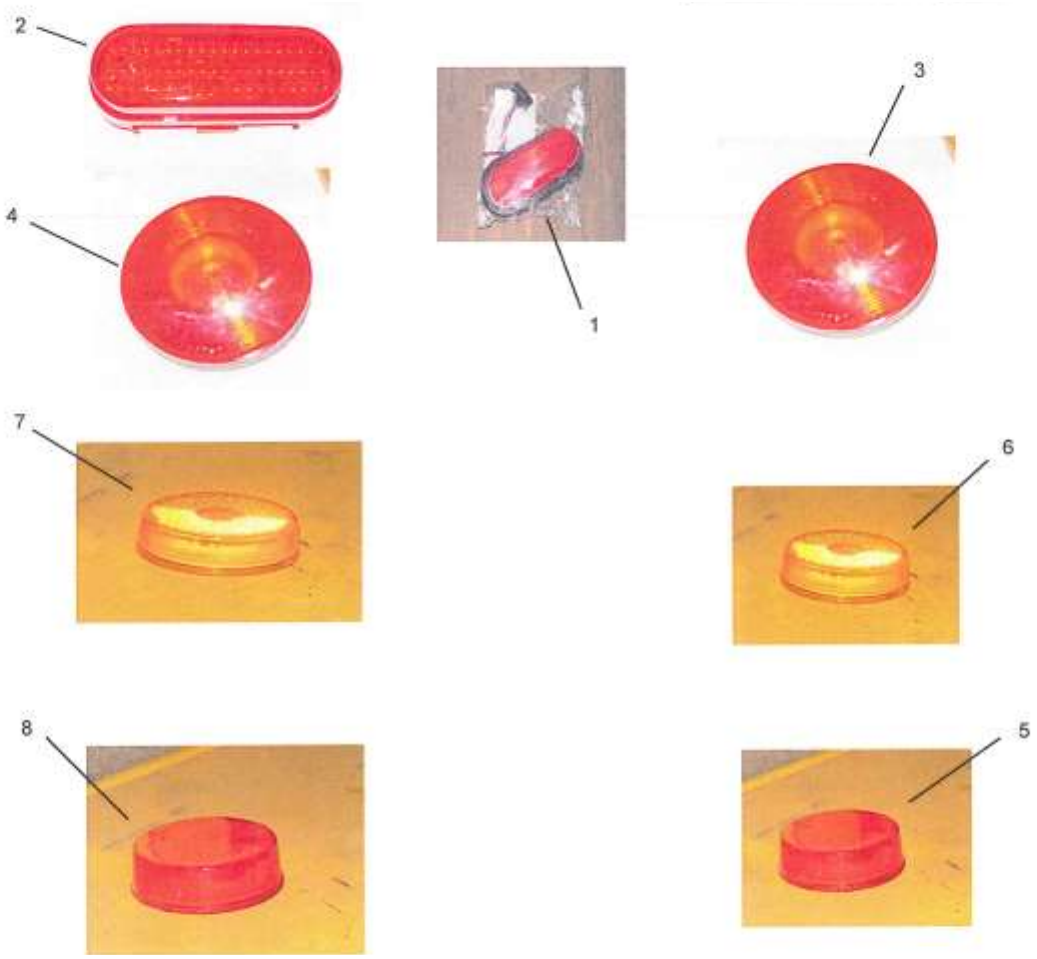
Chassis Lighting Connectors





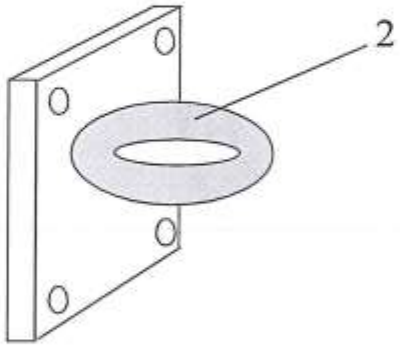
ITEM	QTY	DESCRIPTION	PART#
1	1	Connector-7 Pin Flat Female	48485
2	1	Connector-7 Pin Flat Male	P10002841
3	1	Connector-7 Pin Round Female	526017
4	1	Connector-7 Pin Round Male	P10002840
5	1	Connector-6 Pin Round Female	P10002838
6	1	Connector-6 Pin Round Male	P10002839
0	1	Connector-4 Pin Round Female	526103
0	1	Connector 4 Pin Round Male	526014
0	1	Connector 9 Pin Round Female	P10002758
0	1	Connector 9 Pin Round Male	P10002562

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.



ITEM	QTY	DESCRIPTION	PART#
1	1	Oval Red Taillight 6"	P10002899
2	1	Oval Red Taillight LED 6"	P10007080
3	1	Round Red Taillight	P10002896
4	1	Round Red LED Taillight 4"	44030R
5	1	Round Red Clearance Light 2.5"	P10002892
6	1	Round Amber Clearance Light 2.5"	P10002893
7	1	Round Amber Clearance Light LED 2.5"	P10002894
8	1	Round Red Clearance Light LED 2.5"	P10002891

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.
Note: All light kits include light, mounting grommet and wire pigtail.



ITEM	QTY	DESCRIPTION	PART#
1	1	Screw Jack, 15" body	501051
	1	Screw Jack, 20" body	P10001273
2	1	Ring Hitch	W10004075
00	1	Ball Hitch, 2 5/16"	901038
00	1	Ring hitch-model 10 actuator, hydraulic brakes	901317
00	1	Right hitch-model 20 actuator, hydraulic brakes	901317A

Note: Illustrations are for parts identification only. Illustrations may not represent actual parts.

CONVEYOR ASSEMBLY	P/N
Belt Conveyor 18"x332"	P10006477
Hydraulic Motor	P10006578
Sprocket #50 Chain 1" Bore	P10006471
Chain- 50# Roller	P10006227
Master Link #50	P10006480

ENGINE	P/N
Engine Cabinet	A10008210
1505 Engine Assembly	A10008263-002
Includes:	
Fuel Pump 12 volt DC	P10000156
Kubota 1505 Diesel 60 Amp Alter.	P1000-8223-003
Drain Valve - Kubota 1505	P10009328
Throttle Cable- Kubota 1505	M10009021
Eaton 420 Pump	P10009199
Relay- 12VDC SPST 100A	P10009211

WASH DOWN	P/N
Veejet Nozzle- H1/4VV-9508	P10002943
Washdown Sprayer	P10008710
Washdown Wand	M10008709
Lighting Wand Holder	W10007674

PRODUCT PUMP	P/N
Pump- HL32 L/RV Product	P10004373
Key Stock 3/16x3/16	P10002018
Key Stock 1/4x1/4	P10002019
Valve- 1 1/2- 3 way Ball Valve	P10004387
Valve 1" - 3 way Ball Valve	P10004391
Chain Hub - 4016x 3/4	P1000455-002
Chain Hub - 4016x 1 Bore	P1000455-004
Chain Only 4016	P10004556
Hydraulic Motor- 5.7 CI A-2 Bolt	P10009016
2" Suction Screen	W10004337

TRAILER	P/N
Tire- Wheel Assembly 225/75R15	P10004643
Chain- Safety w/Hook 48 GR 43	P10004671
Axle- 672DUE w/Elec Brakes	P10006584
Pintle Ring	W10004075
Screw Jack	W10007212

LIGHTS	P/N
Strobe Light Beacon	P10008362
Light- 2.5" Red Clearance	P10002892
Light- 2.5" Amber Clearance	P10002893
Light- 6" Oval Stop- Tail- Turn	P10002899

MISCELLANEOUS	P/N
Compactor Plate Carrier Winch	P10002298
Break Away Switch Assembly	A10003683
Battery Box Assembly	A10003290
Shovel Platform Assembly	A10008702-002
60 Gal Fuel Tank Assembly	A10008792
Hydraulic OIL #32	P10001292
Hydraulic Cap and Screen	P10001114
Valve- 2" Ball 2 Port	P10005993
Sight Gauge	P10007361
Suction Strainer	P10008421
35 Gal Hydraulic Tank	W10008975
Valve- 1 1/2 2 way Ball	P10008125
Drain Cock Assembly	A10008922
Flex Hose 1" MNPT x FJIC x 36	P10008456-036

NHTSA

NHTSA Reporting Safety Defects

If you believe that your vehicle has a defect in which could cause a crash or could cause injury or death, you should immediately inform the National Highway Traffic Safety Administration (NHTSA) in addition to notifying STEPP MANUFACTURING CO., INC..

If NHTSA receives similar complaints, it may open an investigation and if it finds that a safety defect exists in a group of vehicles, it may order a recall and remedy campaign. However, NHTSA cannot become involved in individual problems between you, your dealer, or STEPP MANUFACTURING CO., INC..

To Contact NHTSA, you may either call the Auto Safety Hotline toll-free at 1-888-327-4236 (TTY: 1-800-424-9153); go to http://www.safecar.gov; or Write to: NHTSA, US Department of Transportation, 1200 New Jersey Ave., S.E., Washington DC 20590. You can also obtain information about your motor vehicle safety from http://www.safecar.gov.

STEPP MFG™

ASPHALT MAINTENANCE EQUIPMENT

Consumer Warranty Guide

12325 River Road, North Branch, MN 55056~ Phone: 651-674-4491~ Fax: 651-674-4221 www.steppmfg.com

Introduction

Congratulations on your purchase of equipment built by Stepp Manufacturing for your asphalt maintenance needs. Your equipment has been designed and constructed to give you the most in performance, ease of use, and reliability. It is our desire that you will find operating the equipment both productive and profitable.

Warranty Procedures Through A Dealer

If your equipment requires repair, or needs parts for repair, please contact your area dealer. For repairs, the unit must be brought to the dealer for warranty. The dealer will require purchase date information, where the machine was purchased, and the Vehicle Identification Number (VIN) of the equipment. This information is needed so the dealer can submit a warranty claim. The dealer will repair your equipment, once warranty is approved, at no charge to you under the provisions of the warranty policy.

Warranty Procedures Direct Through The Factory *(when no servicing dealer is available in your area)*

Contact Stepp Manufacturing's Customer Service Department at (651) 674-4491.

In this situation, it may be advantageous for you to repair the machine and be reimbursed direct from the factory for warranty repairs. If you do not have the facilities, or the technicians, to perform the repair, the unit can be brought to a local repair facility. In either case, Stepp Manufacturing ***MUST*** be contacted and authorize the warranty repair ***PRIOR*** to any work being performed. If work is done prior to authorization, the warranty will not be honored.

If parts are required for the warranty repair, contact Customer Service at Stepp Manufacturing for replacements. When warranty replacement parts are shipped to you, a Warranty Authorization Number will be issued. If asked to return the defective parts, "tag" the defective parts with the Warranty Authorization Number, then package them in the same box the new parts were shipped in. Ten (10) business days will be allowed for return of the defective parts. If the defective part is not received back at the factory within this allotted time, the warranty will not be honored.

You will be billed for all parts shipped that require returning of defective parts. However, when the defective parts are returned and evaluated, you will receive credit for the cost of the part only. Thus, it is important that all defective parts are turned to Stepp Manufacturing in the allotted ten (10) day period.

Engine Warranty Claims

When a warranty issue develops with the engine, bring the unit to the engine manufacturer nearest authorized service center for repair. Be prepared to supply them with proof of purchase information with purchase dates.

Stepp Manufacturing cannot process engine warranty claims. However, we will be happy to offer assistance in locating the nearest service center.

Equipment Owner Responsibilities

As the equipment owner, you are responsible for:

- Using the equipment in accordance with the correct operating procedures as shown in the operators manual.
- Assuring all maintenance items are completed in accordance with the operators/maintenance manuals.
- Transporting the equipment to the place where warranty repairs can be completed.
- Supplying purchase date and VIN information to establish warranty coverage.

General Warranty Statement
Stepp Manufacturing's One (1) Year Limited Warranty

Stepp Manufacturing Co., Inc. hereby warrants, to the original purchaser of new equipment, that products manufactured by Stepp Manufacturing will be free from defects in material and workmanship for a period of one (1) year from the date of purchase from Stepp Manufacturing.

Stepp Manufacturing, at is discretion, will provide for the repair or replacement of any part found, upon examination by Stepp Manufacturing, to be defective, except as noted below. Such repair or replacement shall be free of charge to the original purchaser of new equipment for a period of one (1) year from the date of purchase, except as noted below.

No warranty is extended to cover:

- Product pump wear or damage caused by foreign objects.
- Routine maintenance, cleaning, and adjustments.
- Parts or components that have been altered, misused, improperly adjusted, or improperly maintained.
- Transportation to and from the place of warranty repair.
- Removal of materials from equipment.

The following items are covered solely by their manufacturer's warranty:

- Engines
- Hydraulic components
- Burners
- Pumps
- Axles
- Tires
- Other component parts not solely manufactured by Stepp Manufacturing

The following items are covered by a pro-rata warranty:

- Hoses that carry heated materials
- Heating elements for material hoses and wands

Disclaimer of further warranty:

Stepp Manufacturing makes no warranty, expressed or implied, other than this warranty. The implied warranties of merchantability and fitness for a particular purpose are hereby disclaimed. Repair or replacement of products or parts proving to be defective in material or workmanship shall be the exclusive remedy for breach of this warranty.

Stepp Manufacturing shall not be liable for incidental or consequential damages. Including, but not limited to, damages for inconvenience, rental or purchase of replacement equipment, loss of profits, or other loss resulting from breach of this warranty.

Stepp Manufacturing reserves the right to incorporate any changes in design into its products without obligation to make such changes on products previously manufactured.

Twelve (12) Month Pro-Rata Limited Warranty
Heated Asphalt Hose and Heating Elements

Effective for Equipment Delivered After 5/1/2012

Stepp Manufacturing Co., Inc. hereby warrants to the original purchaser, on a pro-rated basis, that the heated asphalt hose and heating elements installed on NEW Stepp Manufacturing's equipment shall be free from defects in material and workmanship for period of twelve (12) months for the heated asphalt hose and six (6) months for the heating element.

In the event that a heated asphalt material hose or a heating element fails under normal use during the warranty period, Stepp Manufacturing will supply a replacement heated asphalt hose or heating element, along with one-half (0.5) hour for installation labor on a pro-rated adjustment basis.

- If the failure occurs under normal use within the first three (3) months from date of purchase, Stepp Manufacturing will supply a replacement, and provide for one-half (0.5) hour installation labor at no charge to the customer.
- If the failure occurs under normal use within the fourth (4th) through twelfth (12th) months, Stepp Manufacturing will supply a replacement, and provide for one-half (0.5) hour installation labor on a pro-rata basis.

The pro-rated adjustment is based on the total number of months elapsed since the purchase date of the new equipment from Stepp Manufacturing. This rate is then applied to the one-half (0.5) hour labor rate and the current suggested retail price of the proper replacement heated asphalt hose or heating element supplied by Stepp Manufacturing. This is the amount the customer will have to pay. Freight will not be included in the reimbursement. If a new heated asphalt hose or heating element is needed prior to warranty inspection, you will be billed for all parts shipped that require returning of defective parts. However, when the defective parts are returned and evaluated, you will receive credit for the cost of the part only. **Thus, it is important that all defective parts are turned in to Stepp Manufacturing in the allotted ten (10) day period, or warranty will be denied.**

In no case will the warranty coverage extend beyond the six (6) month period for the heating element or the twelve (12) month period for the heated asphalt hose, from the original purchase date of the new equipment from Stepp Manufacturing. *Physical damage is not covered by this warranty*. Physical damage may include, but is not limited to:

- Broken heating element (typically caused by repeated bending to less than a one (1) foot radius).
- Heated asphalt hoses burnt from the inside (typically caused by operating the heating element in an empty hose).
- External cuts or abrasions on the heated asphalt hose (typically caused by dragging on the ground).

The chart below shows the pro-rated amount, by percentage, that will be allowed by warranty, pending examination of the heated asphalt hose or heating element.

Heated Asphalt Hose		
Failure Date	**Warranty's Responsibility**	**Customer's Responsibility**
0-3 Months *0-90 Days*	100%	0%
3-6 Months *91-180 Days*	70%	30%
6-7 Months *181-211 Days*	60%	40%
7-8 Months *212-242 Days*	50%	50%
8-9 Months *243-273 Days*	40%	60%
9-10 Months *274-304 Days*	30%	70%
10-11 Months *305-335 Days*	20%	80%
11-12 Months *336-365 Days*	10%	90%
After 12 Months	0%	100%

Heating Element		
Failure Date	**Warranty's Responsibility**	**Customer's Responsibility**
0-3 Months *0-90 Days*	100%	0%
3-4 Months *91-121 Days*	60%	40%
4-5 Months *122-152 Days*	40%	60%
5-6 Months *153-180 Days*	20%	80%
After 6 Months	0%	100%

STEPP MFG™
ASPHALT MAINTENANCE EQUIPMENT

Warranty Claim Authorization Number: _____
Call Customer Service at 651-674-4491 to obtain prior approval or warranty will be denied.
Date of Authorization Request _____

Equipment Owner		Warranty to be Performed by	
Customer Name		Company Name	
Street Address		Address	
City/State/Zip		City/State/Zip	
Equipment Model #		Contact Name	
Equipment VIN		Contact Phone #	
Hour Meter Read			
Purchase Date		Date of Malfunction	
Dealer Purchased Form		Date of Repair	

Warranty Authorization		Signature for Authorization
Date of Malfunction		X
Date of Repair		

Symptoms / Diagnostics / Action

Symptoms	Diagnostics	Action
Describe the symptoms in detail, be as specific as possible. Ex: Burner ignites and runs for 35 seconds, then goes out.	*Describe issues found, be as specific as possible. Ex: Part failed due to loose connection, resulting in misalignment and premature wear.*	*Describe action taken, be as specific as possible. Ex: Removed damaged section of wire harness, soldered new leads in place, and insulated splices w/ heat shrink tubing.*

Parts and Labor

Labor Time to Correct Problem (reimbursed at $55/hour)		Parts Used to Correct Problem		
Labor Time (in hours)	Repair Made	Part Number	Description	Qty

Parts Return

All parts returned must be tagged with the warranty authorization number and a copy of this claim. Retain all parts until credit is received from the factory. When requested, return the parts, along with this claim, to:

Stepp Manufacturing Co., Inc.
Attn: Warranty Department
12325 River Road
North Branch MN 55056

*__Note__: If defective parts are not returned within 10 days, or this warranty claim does not accompany the returned parts, the claim will be denied.

Office Use Only

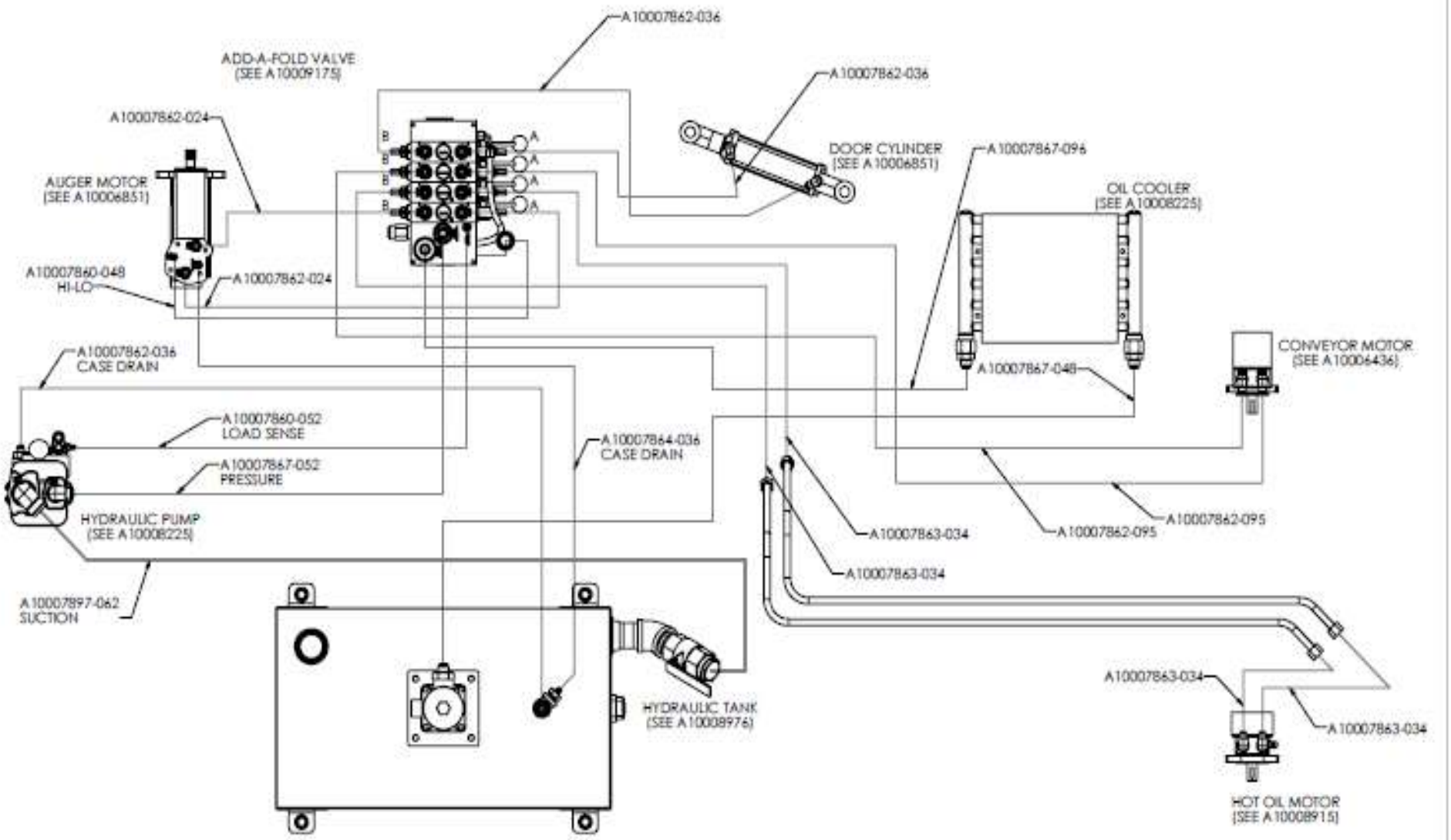
Date Claim/Parts Received?		Is this a warrantable claim?	Yes	No
Claim Reviewed By:		Original Invoice # for Parts		
Date of Review:				

Warranty Totals

SCHEMATICS

NOTE: FOR FITTINGS, SEE RESPECTIVE ASSEMBLIES

REVISIONS			
REV.	DESCRIPTION	DATE	APPR
B01	RELEASED FOR PROTOTYPE	1/10/2011	



STEPP MFG

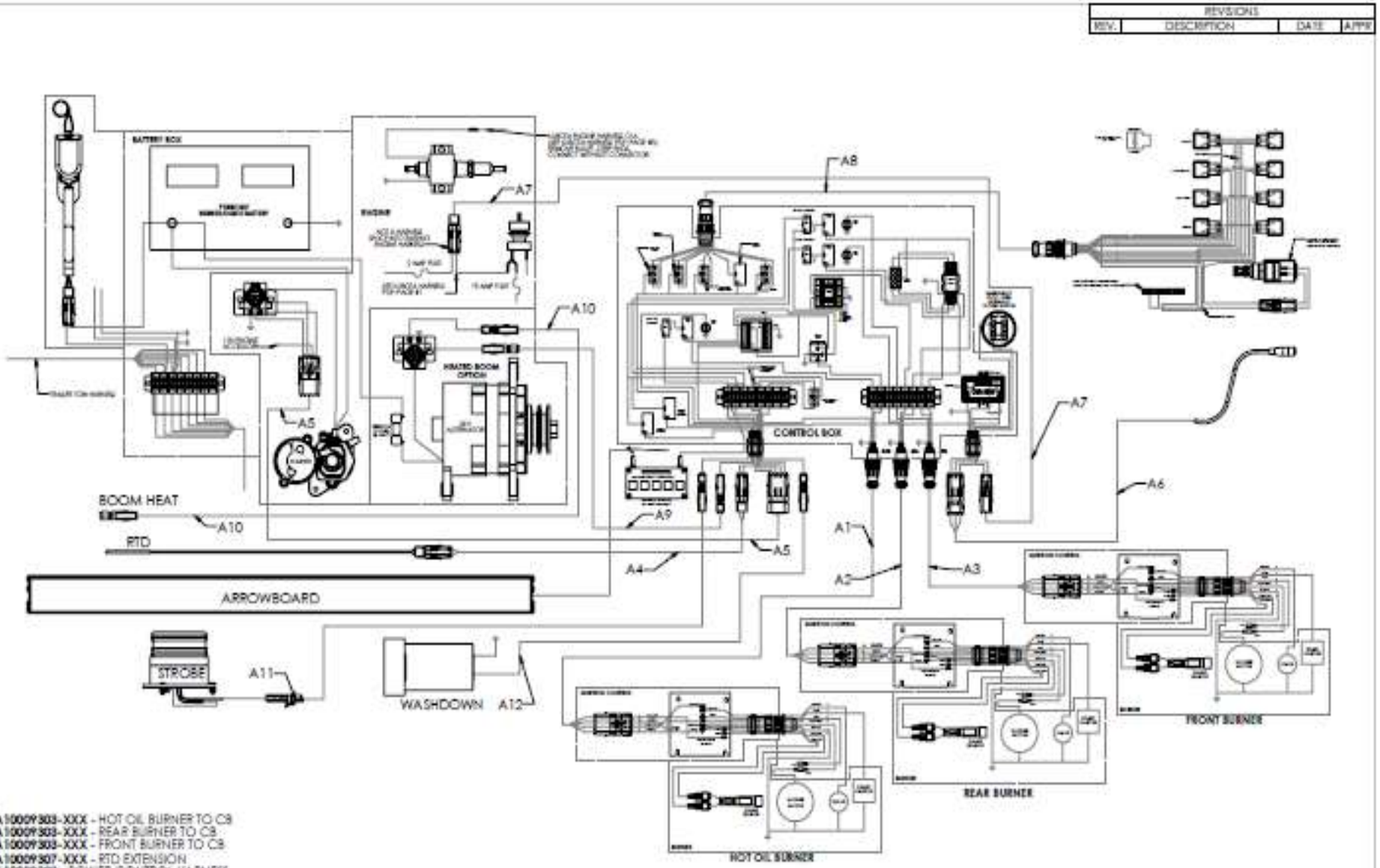
STEPP MFG. CO. INC.

ELECT. HTG. SCHEMATIC

S10009228

B01

SCALE: 1:8


REVISIONS
REV.
DESCRIPTION
DATE
APP'D
BATTERY BOX
ENGINE
HEATED BOOM OPTION
CONTROL BOX
BOOM HEAT
RTD
ARROWBOARD
STROBE
WASHDOWN
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
FRONT BURNER
REAR BURNER
HOT OIL BURNER
NOTE:
A1 - A10009303-XXX - HOT OIL BURNER TO CB
A2 - A10009303-XXX - REAR BURNER TO CB
A3 - A10009303-XXX - FRONT BURNER TO CB
A4 - A10009307-XXX - RTD EXTENSION
A5 - A10009309 - POWER CONTROL HARNESS
A6 - A10009301 - HOT OIL MOTOR HARNESS
A7 - A10009308 - EMERGENCY STOP TO ENGINE
A8 - A10009374 - HYDRAULIC VALVE HARNESS
A9 - A10000XXX-XXX - BOOM HEAT CTRL HARNESS
A10 - A10000XXX-XXX - HEATED BOOM HARNESS
A11 - A10000XXX-XXX - STROBE LIGHT HARNESS
A12 - A10009313-XXX - WASHDOWN HARNESS
DASHED LINES
REPRESENT OPTIONS
STEPP MFG
STEPP MFG. CO. INC.
SRM OVERALL SCHEMATIC
SRM STANDARD OVERALL
ROUTINGS
SCALE: 1:8
A10009439

HYDRAULIC OIL MSDS

MATERIAL SAFETY DATA SHEET

SECTION 1	PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **UNIVIS N 32**
Product Description: Base Oil and Additives
Product Code: 8259
Intended Use: Hydraulic fluid

COMPANY IDENTIFICATION

Supplier: **Canada Imperial Oil Limited, An Affiliate of Exxon Mobil Corporation**
P.O. Box 4029, Station A
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Health Emergency	519-339-2145
Transportation Emergency Phone	519-339-2145
Supplier General Contact	1-800-567-3776

SECTION 2	COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
HYDROTREATED LIGHT NAPHTHENIC DISTILLATE (PETROLEUM)	64742-53-6	20 - 30%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3	HAZARDS IDENTIFICATION

This material is not considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL HEALTH EFFECTS

Low order of toxicity. Excessive exposure may result in eye, skin, or respiratory irritation. High-pressure injection under skin may cause serious damage.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity: 0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4	FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

First aid is normally not required. Seek medical attention if discomfort occurs.

SECTION 5	FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Pressurized mists may form a flammable mixture.

Hazardous Combustion Products: Smoke, Fume, Sulfur oxides, Aldehydes, Oxides of carbon, Incomplete combustion products

FLAMMABILITY PROPERTIES

Flash Point [Method]: 165C (329F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Auto ignition Temperature: N/D

SECTION 6	ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. U.S. regulations require reporting releases of this material to the environment which exceed the reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7	HANDLING AND STORAGE

HANDLING

Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8	EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits/standards for materials that can be formed when handling this product: When mists / aerosols can occur, the following are recommended: 5 mg/m³ - ACGIH TLV, 10 mg/m³ - ACGIH STEL, 5 mg/m³ - OSHA PEL.

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

No special requirements under ordinary conditions of use and with adequate ventilation.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9	PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below. Consult the Supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State: Liquid
Color: Yellow
Odor: Characteristic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.87
Flash Point [Method]: 165C (329F) [ASTM D-93]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Auto ignition Temperature: N/D
Boiling Point / Range: 229C (444F) - 512C (954F)
Vapor Density (Air = 1): N/D
Vapor Pressure: [N/D at 40 °C] | < 1 kPa (7.5 mm Hg) at 38C
Evaporation Rate (n-butyl acetate = 1): < 0.1
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
Solubility in Water: Negligible
Viscosity: 32 cSt (32 mm2/sec) at 40 C
Oxidizing Properties: See Sections 3, 15, 16.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -48°C (-54°F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10	STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Excessive heat. High energy sources of ignition.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11	TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 5000 mg/ m3	Minimally Toxic. Based on assessment of the components.
Irritation: No end point data.	Negligible hazard at ambient/normal handling temperatures. Based on assessment of the components.
Ingestion	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation (Rabbit): Data available.	Negligible irritation to skin at ambient temperatures. Based on assessment of the components.
Eye	
Irritation (Rabbit): Data available.	May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

CHRONIC/OTHER EFFECTS

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

Additional information is available by request.

The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12	ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

BIOACCUMULATION POTENTIAL

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13	DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

RCRA Information: The unused product, in our opinion, is not specifically listed by the EPA as a hazardous waste (40 CFR, Part 261D), nor is it formulated to contain materials which are listed as hazardous wastes. It does not exhibit the hazardous characteristics of ignitability, corrositivity or reactivity and is not formulated with contaminants as determined by the Toxicity Characteristic Leaching Procedure (TCLP). However, used product may be regulated.

Empty Container Warning PRECAUTIONARY LABEL TEXT: Empty containers may retain residue and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations.

SECTION 14	TRANSPORT INFORMATION

LAND (DOT) : Not Regulated for Land Transport

LAND (TDG) : Not Regulated for Land Transport

SEA (IMDG) : Not Regulated for Sea Transport according to IMDG-Code

AIR (IATA) : Not Regulated for Air Transport

SECTION 15	REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purposes, this material is not classified as hazardous in accordance with OSHA 29 CFR 1910.1200.

NATIONAL CHEMICAL INVENTORY LISTING: DSL, TSCA

EPCRA: This material contains no extremely hazardous substances.

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY: This material contains no chemicals subject to the supplier notification requirements of the SARA 313 Toxic Release Program.

The Following Ingredients are Cited on the Lists Below:*

Chemical Name	CAS Number	List Citations
HYDROTREATED LIGHT NAPHTHENIC DISTILLATE (PETROLEUM)	64742-53-6	13, 17, 18
PHOSPHORODITHOIC ACID, O,O-DI C1-14-ALKYL ESTERS, ZINC SALTS (2:1) (ZDDP)	68649-42-3	15

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive
* EPA recently added new chemical substances to its TSCA Section 4 test rules. Please contact the supplier to confirm whether the ingredients in this product currently appear on a TSCA 4 or TSCA 12b list.

SECTION 16	OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:
No revision information is available.

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