2894

Assembly and
Installation Manual

Technical Manual

INTRODUCTION

This publication is provided solely as a guide for individuals who have received METTLER TOLEDO Technical Training in servicing the METTLER TOLEDO product.

Information regarding METTLER TOLEDO Technical Training may be obtained by writing to:

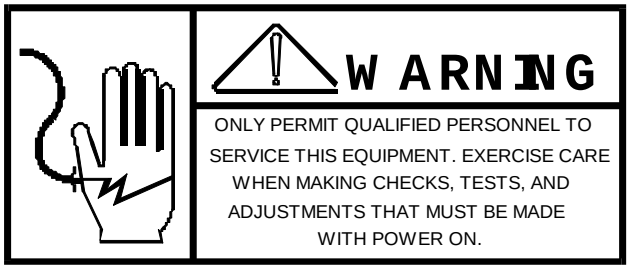
METTLER TOLEDO
Training Center
P.O. Box 1705
Columbus, Ohio 43216
(614) 438-4400

PRECAUTIONS

- **READ** this manual before operating or servicing this equipment.

- **ALWAYS REMOVE POWER** and wait at least 30 seconds **BEFORE** connecting or disconnecting any internal harnesses. Failure to observe these precautions may result in damage to, or destruction of the equipment.

- **ALWAYS** take proper precautions when handling static sensitive devices.



- **DO NOT** connect or disconnect a load cell scale base to the equipment with power connected or damage will result.

- **SAVE** this manual for future reference.

- **DO NOT** allow untrained personnel to operate, clean, inspect, maintain, service, or tamper with this equipment.

- **ALWAYS DISCONNECT** this equipment from the power source before servicing.

- **CALL** METTLER TOLEDO for parts, information, and service.

CONTENTS

1.0 INTRODUCTION

The recommendations provided in this manual are for installation of Mettler Toledo Model 2894 Pit Type Truck Scale. Only qualified personnel can install this equipment.

All sales of goods described herein shall be subject to the standard warranty and the standard terms and conditions of sale published by Mettler Toledo. The specifications and product description contained herein are accurate at the time of publication but are subject to change at any time without notice. Current Engineering drawings take precedence over this information and are the definitive document for all phases of construction.

2.0 PRODUCT SPECIFICATION

2.1 GENERAL DESCRIPTION

Mettler Toledo Model 2894 Pit Type, Concrete Deck, Truck Scale is a pipe lever truck scale to be used with a load cell and an electronic instrument or mechanical dial, or with a Type Registering Beam (TRB).

The levers are fabricated from structural steel shapes and welded together. The deck is free floating with link suspension. Excessive longitudinal movement is prevented with bumper bolts at each end of the weighbridge.

The pit is constructed of reinforced concrete of the same specification as the platform. Pits with several different footing depths are available to accommodate the variation in frost penetration depths across the country. The foundation is designed for use with soil having a minimum bearing capacity of 1500 pounds per square foot. Two ten foot long approach slabs at each end of the platform are an integral part of the foundation and are in conformance with NBS Handbook 44 and State Weights and Measures regulations. See Section 3.1.

2.2 SPECIFICATIONS

TOTAL CAPACITY	SECTIONAL CAPACITY**	PLATFORM SIZE
120,000 x 20 lb	70,000 lb	60 ft x 10 ft
(60,000 x 10kg)	(32,000 kg)	(18.3m x 3m)
120,000 x 20 lb	70,000 lb	70 ft x 10 ft
(60,000 x 10kg)	(32,000 kg)	(21.3m x 3m)

** Sectional Capacity is defined as follows: The maximum allowable live load resulting form a series of axles that can be divided equally on two (2) load supporting members of a section. The plane of the section is the vertical place perpendicular to the longitudinal axis of the scale and passing through the centers of the two suspension links.

2.3 LOAD RATING

120,000 lb SCALES

The maximum allowable loads are: 20,000 lb (9,00 kg) per single axle, 35,000 (16,000 kg) per group of two or more axles spaced between 40 inches (1.02m) and 96 inches (2.44m). The minimum distance between inside axles of adjacent tandems is 128 inches (3.25m). The maximum legal highway load for a vehicle with a three axle tractor and a two axle semi-trailer is 80,000 lbs (36,000 kg). This total may differ by the amount the steering axle differs from the assumed 10,000 lb (4.540kg).

2.4 ACCURACY

The Model 2894 meets or exceeds NBS handbook 44 specifications for accuracy for truck scales.

2.5 ENVIRONMENTAL CONSIDERATIONS

The standard load cell is temperature compendated for a range of -10 to +40 degrees C (12 to 104 degrees F).

The scale will perform to the stated accuracy provided that installation requirements and environmental considerations are met. This includes adequate drainage and clearance of snow and debris from around and under the scale.

3.0 SITE SELECTION

1. The sire must meet state and local requirements. In addition, the following guidelines should be used in the selection of a site and the use of the scale if the scale will be used for commercial weighing. The following is taken directly from handbook 44 (H-44) issued by the National Bureau of Standards.

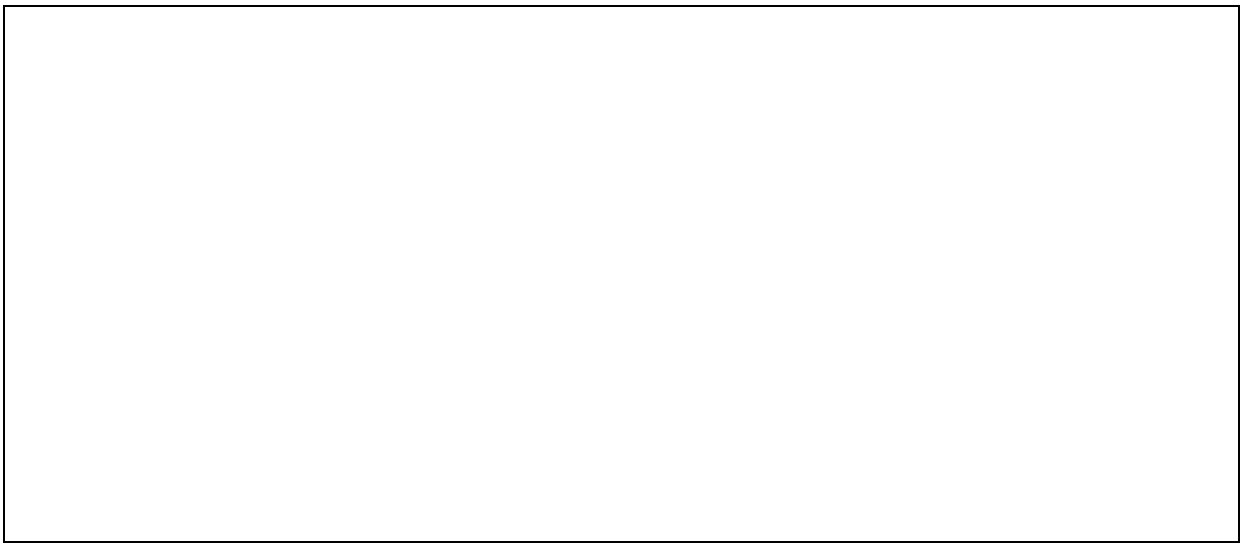
UR.2.6 APPROACHES

UR.2.6.1 TRUCK SCALES - On the approach end or ends of a vehicle scale installed in any one location for a period of six months or more, there shall be a straight approach as follows:
(a) at least the width of the platform, and
(b) at least one half-length of the platform but not required to be more than 40 feet, and
(c) not less than 10 feet of any approach adjacent to the platform shall be constructed of concrete or similar durable material to insure that this portion remains smooth and lever and in the same place as the platform. However, rating of sufficient strength to withstand all loads may be installed in this portion; and further, where deemed necessary for drainage purposes, the remaining portion of the approach may slope slightly.

Mettler Toledo drawings meet all parts of this requirement. The sire must be located to meet pasts (a) and (b). Mettler Toledo drawing number 093409 shows the details of concrete approached from 10 to 12 feet wide and in 5 feet increments to any length.

The standard pit for the 2894 truck scale is 4 feet deep measuring from the top of the coping to the pit floor. Deep pits are 4’6” or 4 feet deep measuring from the bottom of the main girder to the pit floor.

Construction drawings are available for standard depth, and special deep pit designs, in both the 60 and 70 foot lengths.



NOTES:

A) Deep pit states (Minnesota, North Dakota, South Dakota and Montana) require 4’ clearance between the bottom flange of the weighbridge girder and the pit floor.
B) In addition to a deep pit, the states of Iowa, Nebraska and Wisconsin require thicker end and side walls. These pits are Termed “Special Deep”. The state of Iowa required special drainage provisions, details of which are shown on Mettler Toledo drawing number 106884.

2. The site must have good drainage. Surrounding areas must not drain through the scale pit. The ideal scale site is on ground elevated above the surrounding area.

3. The soil must have a minimum bearing capacity for 1,500 pounds per square foot (psf).

4. Check for buried pipes, sewer lines, wired or foundations that would interfere with pit construction.

5. Locate the scale away from high power electrical transmission lines or substations.

6. Pit footings must extend below the frost line. See frost penetration map, Figure 3.1 for reference.

7. Insure that the site has adequate room for trucks to properly align themselves with the platform before pulling on. This is especially important if trucks must turn before pulling onto the scale. For these reasons, scale approaches must conform with Weights and Measures regulations.

8. Allow trucks to remain on the scale no longer than is necessary for obtaining the vehicle weight and printed record.

9. Located the scale in an area in which there will be no traffic traveling in a direction which is perpendicular to the length of the scale.

10. Some Weights and Measures jurisdictions require that the scale platforms be clearly visible from the location of the scale instruments. Others allow the use of closed circuit TV or even voice intercom,. Obtain their approval before starting construction.

11. Provide the scale with a hard surface driveway that can be kept clean and dry, this will in turn keep the scale put clean and dry and reduce scale maintenance costs.

12. Check state Weights and Measures regulations for the proper number and placement of manhole in the deck. It is recommended that the sump or drain be located near a deck manhole for ease of inspecting the drain or sump pump is recommended over the pedestal type with an open motor. If power should fail for a short time during a storm the exposed pump motor could become covered with water and could be ruined when power is restored.

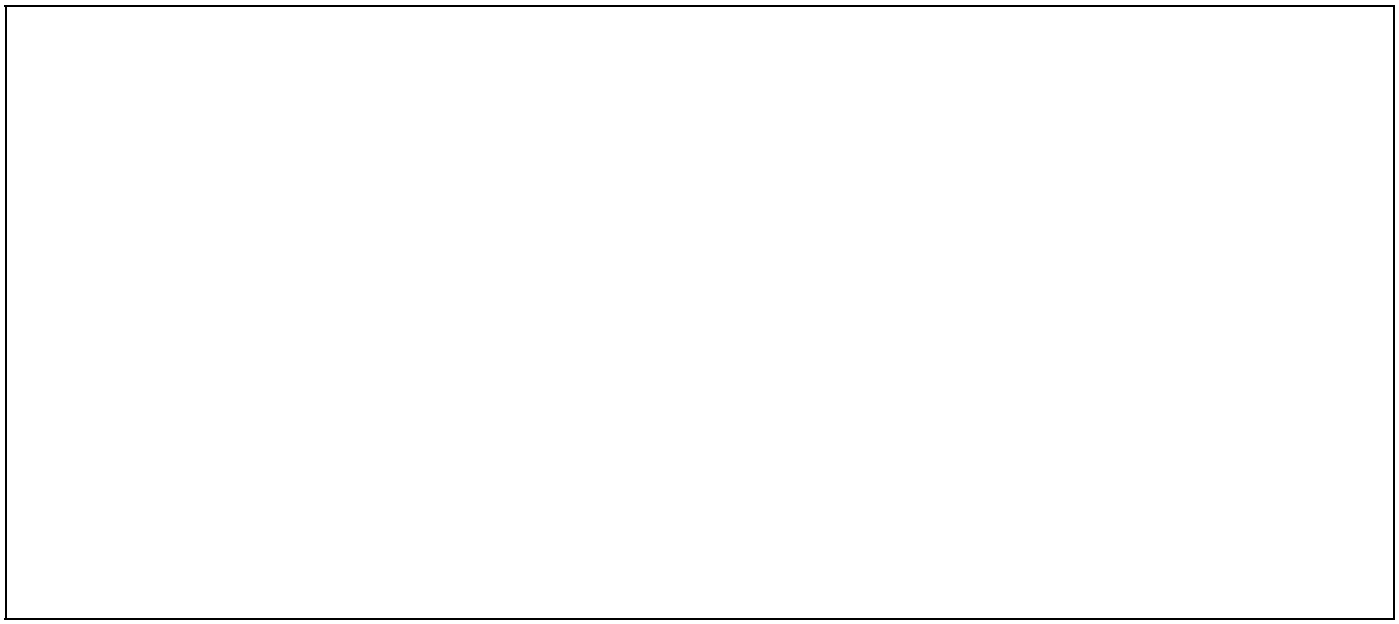


Figure 3.2 - Site Planning

4.0 PIT CONSTRUCTION

The following sequence of construction should be followed:

1. Obtain all drawings and make certain they are the latest released by Mettler Toledo Engineering. The latest drawings will be sent upon receipt of the scale order and also with the shipment of the load cell and scale electronics. Standard drawings are available for deep pit states and special deep pit states (see Section 3.1). Study all drawings, read and understand all general noted on the general layout and the pit prints.

2. Excavate for pit and approaches. Make arrangements at this time for the pit drain to connect with a sewer pipe or drainage ditch.

3. Place gravel underfill. (Optional)

4. Place the reinforcing bars for the put. Insure they are places exactly as shown on the drawings. For electrical grounding purposes the reinforcing bars are tied together with a minimum #16 wire tired at no less than 25% of the intersection points of the rebars. The importance of grounding is discussed in Section 8 of this manual. This section should be read prior to installation.

5. Form and pout put floor slab in one continuous section using concrete of the strength specified on the drawings. If the foundation is subject to frost, air entrained concrete should be used.

   Experience and tests have shown that air entrainment will help prevent concrete scaling from chemical de-icers and freezing temperatures. De-icers must not be applied to the scale, but it is difficult to prevent the trucks from carrying it onto the scale.

6. The foundation should be allowed to cure for sufficient time, usually a minimum of 24 hours so that it will support the forms for the pit walls.

7. Form the pit walls. The curb angles are bolted to the forms. The method shown in the prints helps to keep the put edges straight. The forms must be strong enough to withstand the pressure of the concrete and hold the walls straight while the concrete cured.

8. Allow the pit walls to cure in order to attain sufficient strength to stand alone when the forms are removed.

   NOTE: Some stated require that the piers be poured at the same time as the walls. Consult your local Weights and Measures Agency.

9. Form the piers and set the anchor bolts at this time. Located the anchor bolts from the center line of the pit. Accuracy in the location of the anchor bolts is very important. The anchor bolts can be held in position with boards drilled for the bolts and nailed to the forms of the piers. Allow a minimum of 2 inches for grout thickness between the stands and the top of the piers. Use plastic foam sleeves over the anchor bolts to give clearance for adjustment of the stand. See Figure 4.1.

10. Pour the piers using concrete of the same specifications as that used for the pit.

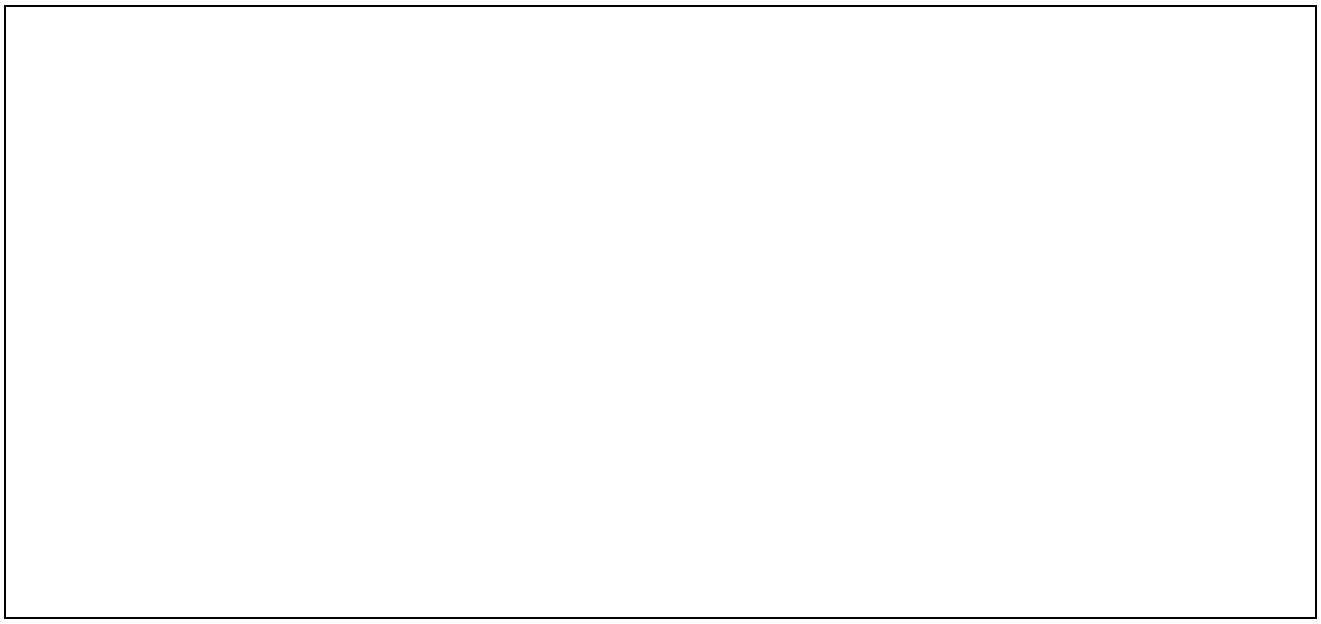


Figure 4.1 - Anchor Bolt Sleeve Detail

11. Remove the forms when the concrete has reached sufficient strength that will enable it to support its own weight.

12. Allow the foundation to cure a minimum of 2 or 3 days before proceeding with construction. The concrete must be allowed to cure to design strength (up to four weeks) and must not be loaded with vehicular traffic until it has reached its design strength. However, construction can proceed as soon as forms are removed.

5.0 LEVER INSTALLATION

1. Before starting any assembly carefully check all pit dimensions. The pit opening must be square. Refer to the pit drawings for these dimensions.

   The relative location of the fulcrum stands and anchor bolts are most critical and must be strictly held to the tolerances given on the pit drawings.

   Correct any discrepancy before starting assembly.

   The measurements on the pit drawing use the pit centerline as reference. Establish a centerline measure and determine the exact center of the pit opening at the ends. Mark each point on the curb angle with a chisel to permanently identify this point. Stretch a chalk line or preferably a wire across the length of the pit at chisel marks. This determines the scale centerline.

   Setting the fulcrum stands is the most critical procedure in the entire installation. Extra time and care must be taken during these procedures to ensure that the levers will be level and in true relationship to each other, the lever connections will be plumb, and the weighbridge deck will be at the proper height with respect to the curb angle.

   When positioning the fulcrum stands be sure that the stands are in position with the centerlines and the end of the pit. Also the stands must be in position with respect to the vertical measurement from the curb angle. (This measurement is taken from the angle to the center of the bearing V-groove). The main bearing stands directly support the weighbridge therefore their vertical position governs the final height of the weighbridge decks. In addition the stands must be level, plumb, firmly anchored and at the proper height.

   Lay a straight 12 foot long 2 x 4 across the pit. Use this to measure from the bottom of the 2x4 to the bottom of the V of the bearing.

When the fulcrum stands are in the correct position the bearings will be in a straight line. A wire stretched from one end of the pit to the other will lay in the bottom of the V in every bearing for the backbone of the scale. (Figures 5.1, 5.2, 5.3, 5.4, 5.5).

A method of lifting and positioning the levers in the pit is required., A heavy duty test truck with boom or a fork truck may be utilized. The main levers weigh almost 600 lb, the 19 foot long backbone lever (when used) can be 800 lb, the shorter backbone lever is about 700 lb. The smaller parts can be set in place by hand.

2. Setting the Levers.
   Before each lever is set in place be sure all pivots and bearings are packed in grease. Use a good grade of water resistant wheel bearing grease to prevent rusting.

   First set all main levers into place. The lever must rest on the fulcrum stands. Place a wooden block under the nose to temporarily support that end of the lever. See Figure 5.1.

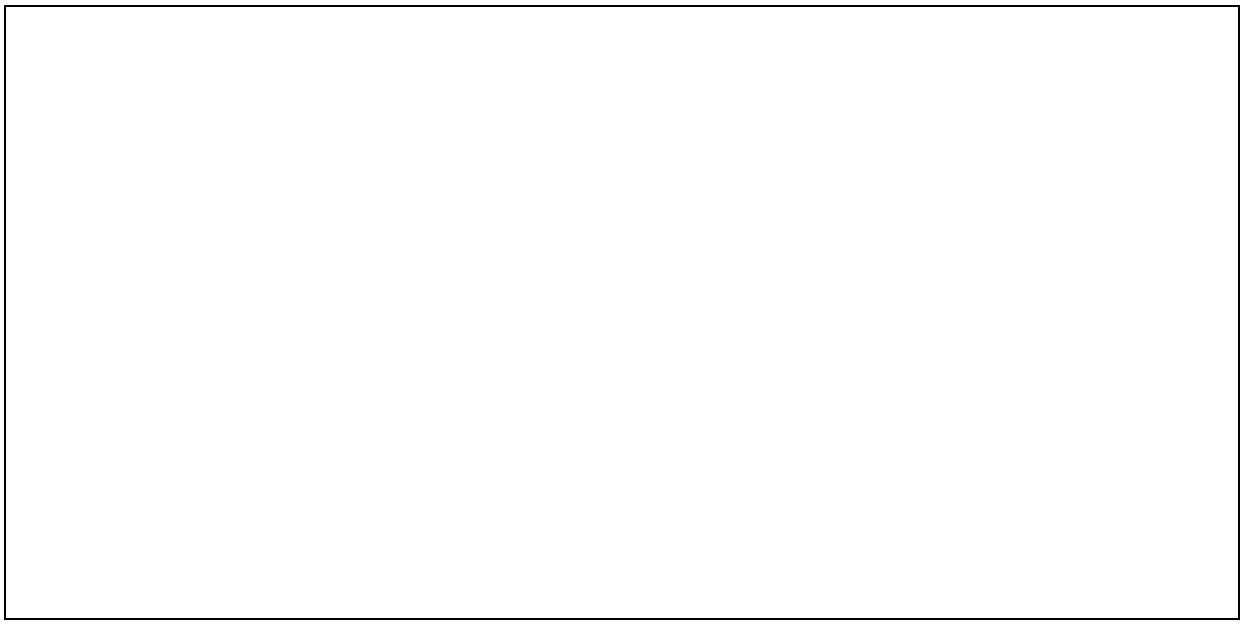
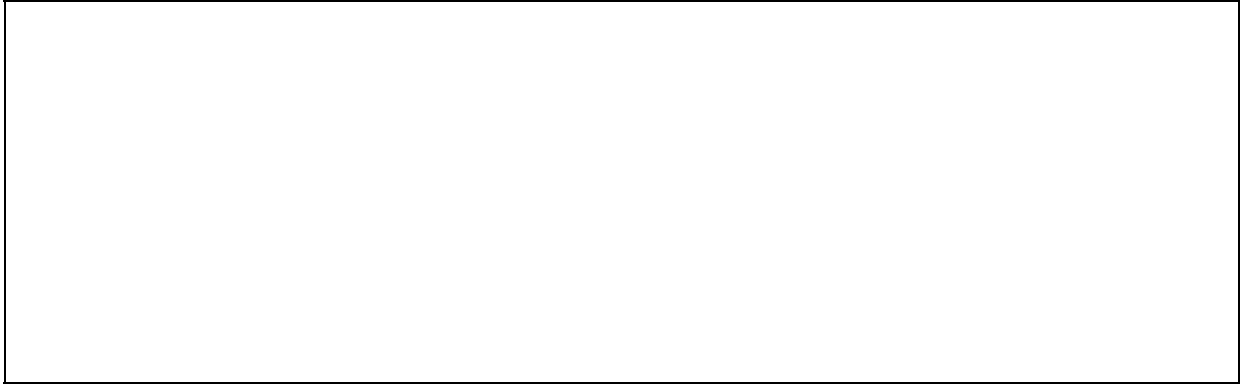
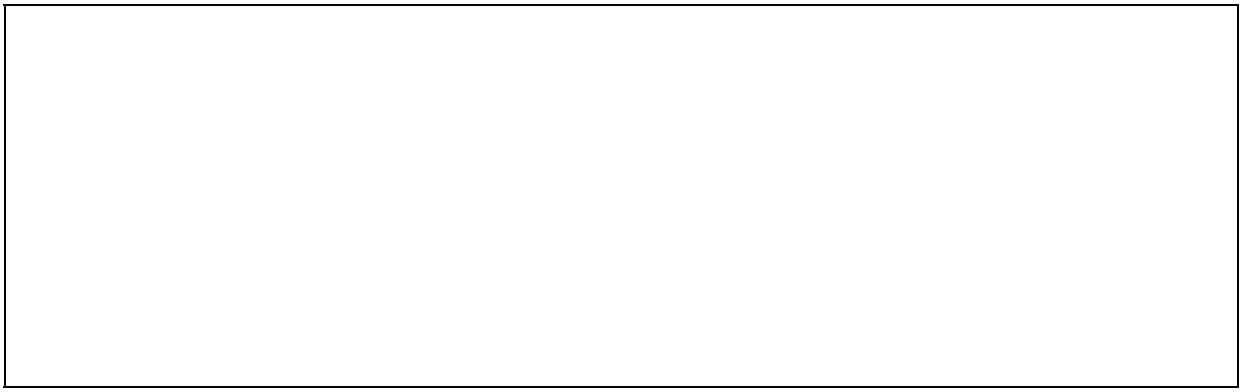


Figure 5.1 - Main Lever and Suspension Parts

3. Place the transverse lever on the put floor approximately where it will be used. Place the center section of the backbone twister on the fulcrum stands., Use blocks to support it while the lever is being bolted together. **DO NOT** tighten the bolts until the lever is in the correct alignment and the pins next to the bolts are started into their holes. After the lever is bolted together, support the nose so that the lever will be level. Support with blocks under the nose or hand with the rod that connects it to the mechanical dial, beam, or load cell. Set a carpenters level on the leveling blocks on the lever and adjust the height of the nose to make the lever level. See Figure 5.2. Support both ends of the backbone lever to keep it stable when parts are added.



Completed Lever System Indicating Location of Main Lever and Suspension



Completed Lever System Indicating Location of Backbone Lever and Fulcrum Stand

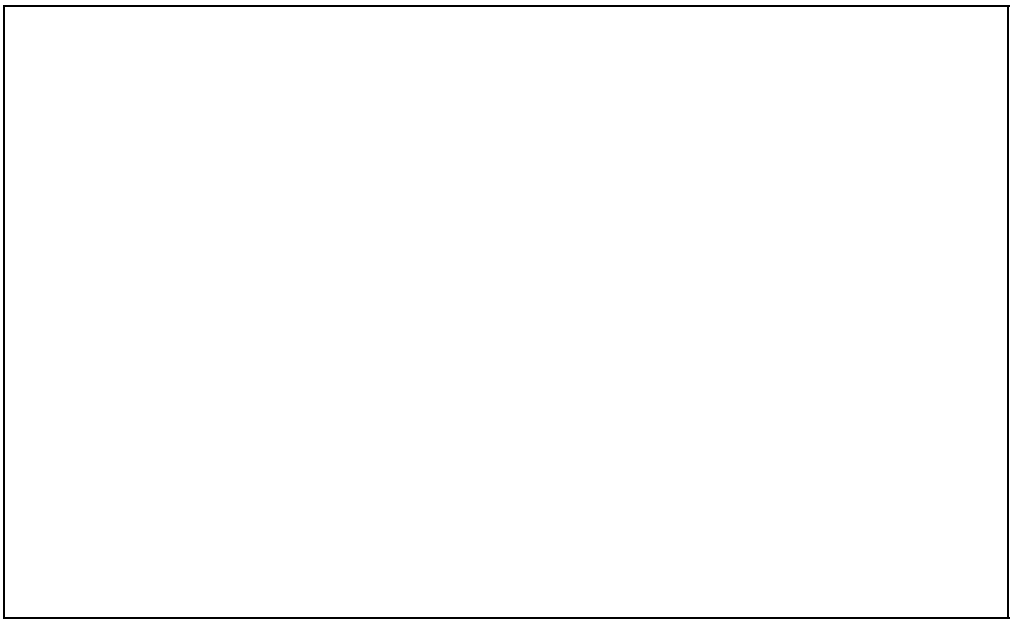


Figure 5.2 - Backbone Lever and Fulcrum Stand

4. Next install the torque tubed with the pins, and connect the universal coupling and secure in place with cotter pins. Do not enlarge any holes in the torque tube or coupling, the pins must fit with minimum clearance. See Figure 5.3.

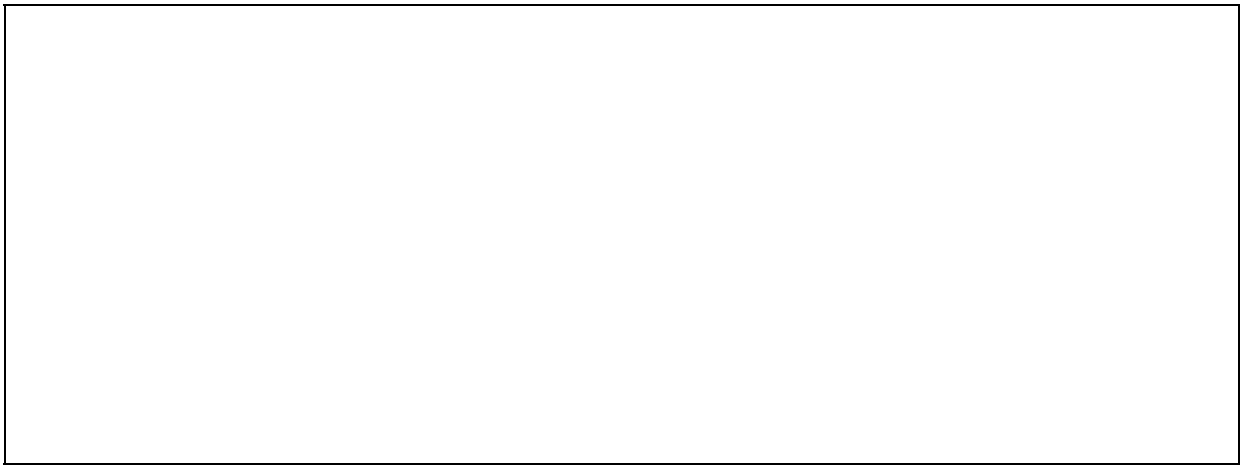


Figure 5.3 - Torque Tube Assembly

5. After the backbone lever is fully assembled and leveled, connect the main levers to the backbone lever. Assemble the connecting link parts, being very careful to assemble them exactly as shown as in Figure 5.4.

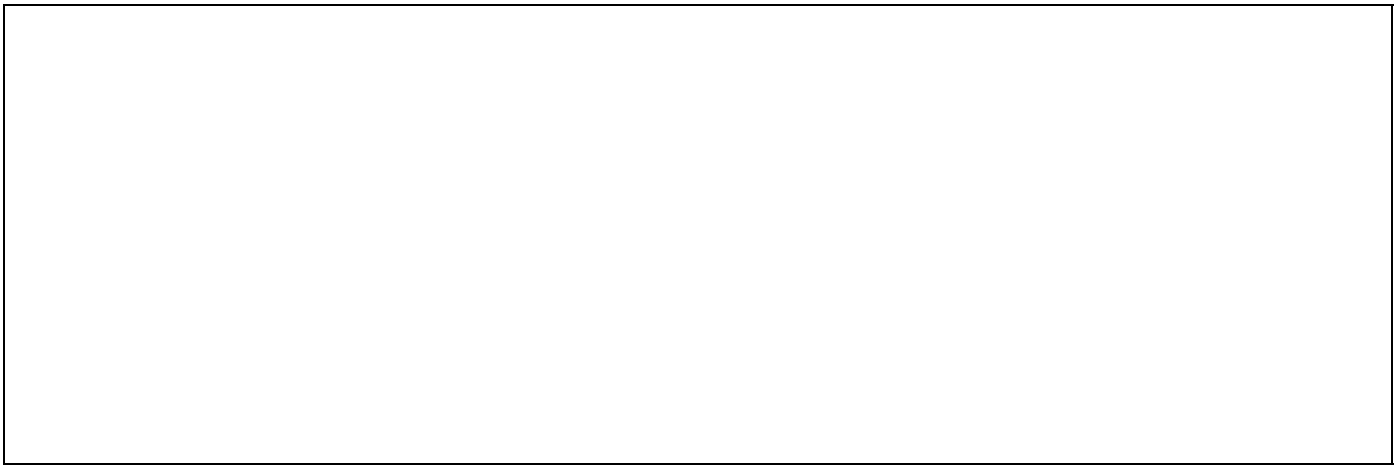


Figure 5.4 - Main Lever to Backbone Connection

6. Adjust the nuts so that the main lever is level. Use a carpenter's level places on the leveling bosses on each lever.

7. If everything is in its correct location the rods on the link assembly will be plumb. **If the rods are not plumb the scale cannot be calibrated.** Find the problem and correct it. Do not continue assembly until the correction as made.

8. After all the levers are level and all links are plumb, lock all the rods with double nuts.

9. Assemble the suspension bearings, links, and pins. Grease the bearings and other contact points on the parts. See Figure 5.5.

10. Place all suspension bearings in the levers and block them to keep them vertical when the weighbridge beams are placed.

    At this time the entire lever system will be supported by the fulcrum stands and at the nose of the transverse lever on the backbone.

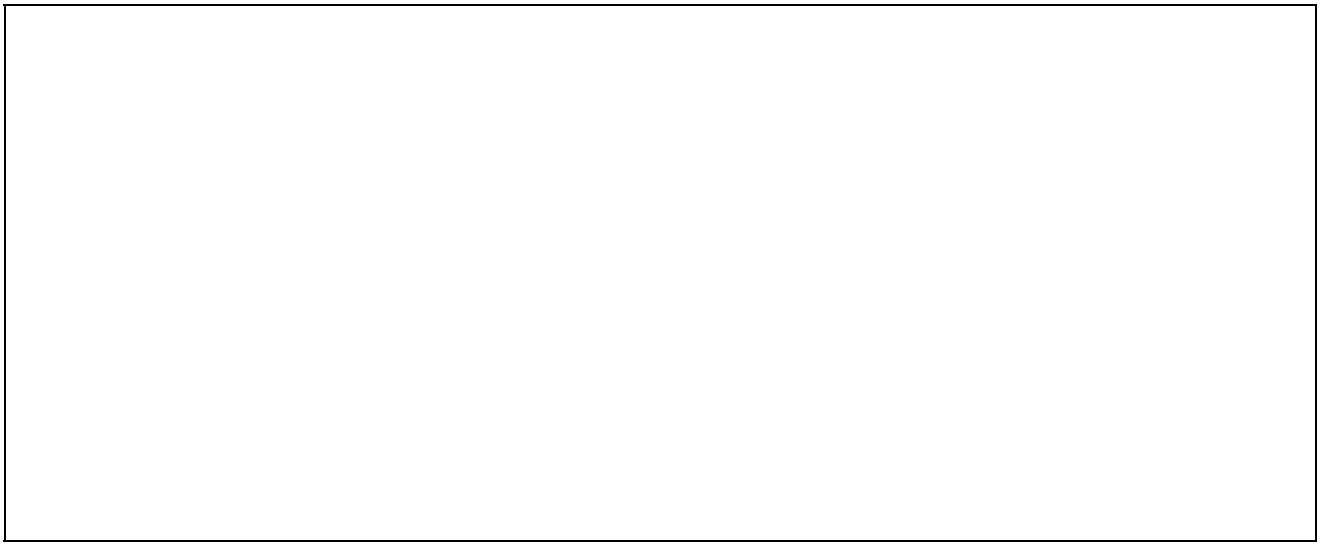


Figure 5.5 - Suspension Assembly

CAUTION!

The two blocks that hold the bearings are not the same size. The larger blocks are used on the bottom at the nose of the main levers. If they are installed wrong they could cause friction that may be hard to located during sealing.

6.0 WEIGHBRIDGE ASSEMBLY

SAFETY PRECAUTIONS - CAUTION!!

When using jacks on the weighbridge, as with any heavy structure, always place shoring or hard wood blocks for support under the steel before reaching under or working on the installation (see Figure 6.1)

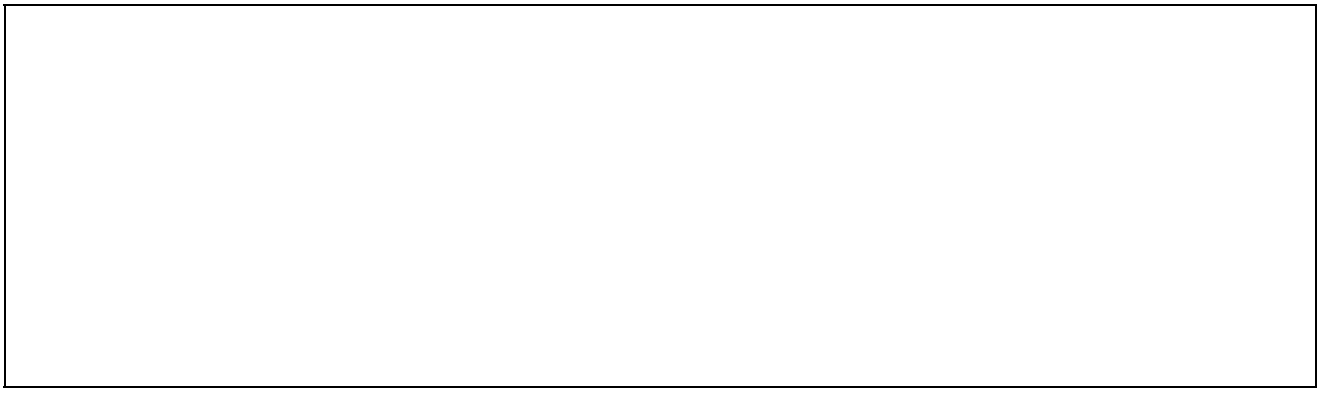


Figure 6.1 - Blocking Instructions

NEVER USE CINDER OR CONCRETE BLOCKS

When blocking the weighbridge, do not use a high single stack of blocks, but arrange blocks to form cribbing as shown below. (Figure 6.1)

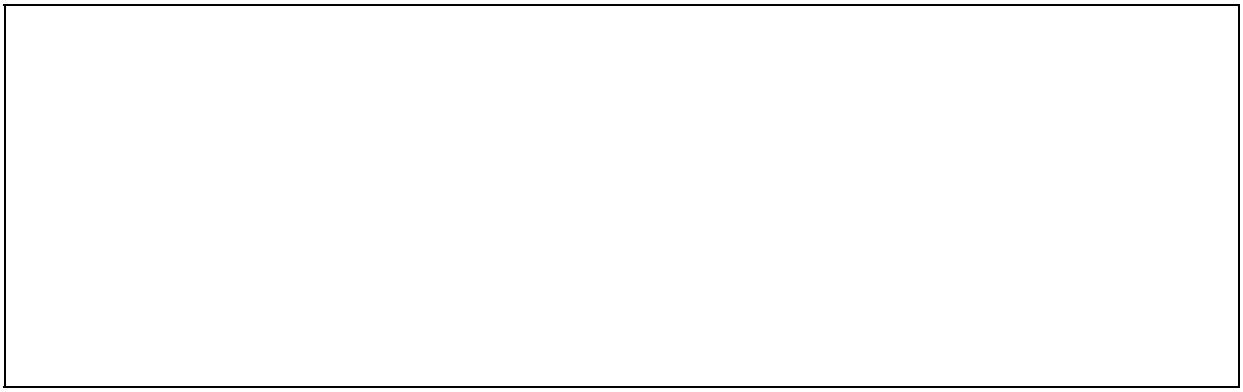


Figure 6.2 - Cribbing Instructions

6.1 TOOLS REQUIRED FOR WEIGHBRIDGE ASSEMBLY

1. Lifting Mechanism
   A method of lifting and moving a 2000 pound girder is required. A heavy duty test truck with boom or a fork lift truck may be utilized.

2. Electronic welder and cutting torch.

CAUTION!!

All electrical welding on or around the scale should be completed before the electronic parts are installed. The welding circuit ground clamp must be connected to the steel member being welded. The high amperage welding current must not pass through any electronic parts.

A portable electric welder of at least 150 amps capacity will be needed for welding the deck coping channel to the main girder and for welding the temporary spacers to hold the platform coping channel in place.

An acetylene cutting torch will be needed to remove the temporary spacers once the concrete platform has cured.

3 Impact Wrench
A 3/4 or 1-inch size impact wrench will save installation time since there are approximately 100 bolts, depending on the length of the platform, which must be tightened to 360 foot pounds each. If an impact wrench is not available, a large socket handle (or steel pipe) about 4 to 5 feet long with be needed to develop the torque necessary to shear the heads of these special bolts. These bolts are used to connect the crossmembers to the main girders.

4. Special “Torx E20” 3/4 Square Drive Socket
   This socket is provided with the scale steel and is used to tighten the special “Torx” bolts that fasten the crossmembers to the main girders.

5. A wrench to fit 1-7/16” nuts is required to hold the nuts on the “Torx” bolts.

6. A spud wrench or tapered punch to line up bolt holes when assembling girders.

7. Equipment for Mixing Grout: a 1/2 inch drill, a mortar mixing paddle for use with the drill motor, and a 5 gallon pail for mixing.

6.2 BREAK-AWAY BOLTS

The bolted crossmember connections use break-away head retaining bolts. This bolt head will shear when the proper torque is reached.

The “Auditorx” High Strength Pan Head Bolt (7/8-9-3” long) is tightened using the 3/4” square drive “Torx” socket provided. BE SURE to carefully follow the assembly instruction drawings for bolt, washer and nut orientations for each connection. (See Figure 6.3).

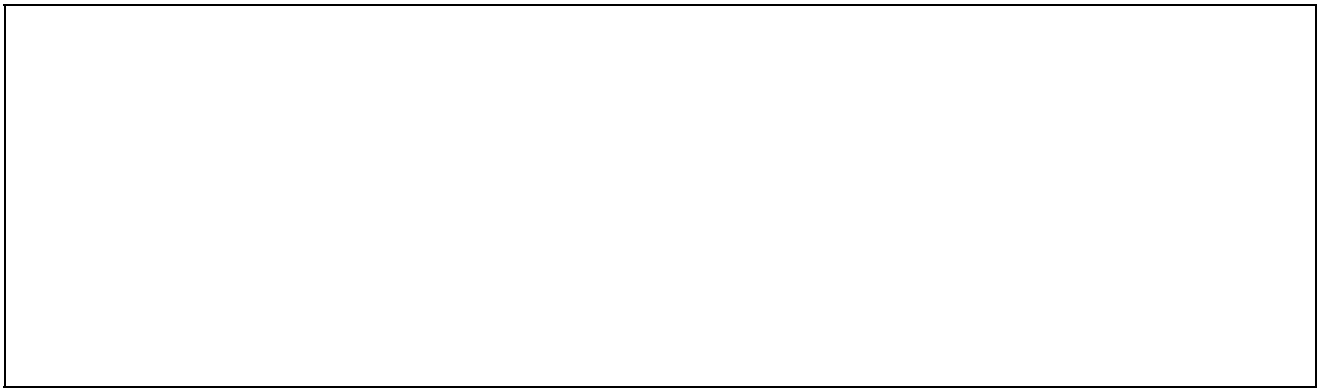


Figure 6.3 - “Torx” Bolt, Washer and Nut Assembly

NOTE: LEAVE ALL BOLTS LOOSE UNTIL WEIGHTBRIDGE STEEL MEMBERS ARE COMPLETELY ASSEMBLED, then apply snug tight and final torque values. **Do not open any holes and do not taper bolts to facilitate installation.**

Contact Vehicle Group is trouble encountered during assembly.

NOTE: Strength development of the bolted connections required that the bolts, nuts, and washers conform to ASTM A-490 specifications, and that the bolt lengths be such that threads are excluded from the shear place. The mating surfaces of the shear plane must be free of dirt or oil.

The “Auditorx” high strength bolts are coated with a lubricant. No additional lubricant shall be used.

6.3 WEIGHBRIDGE ASSEMBLY

To aid in handling the heavy beams of the scale the following approximate weights are given. The main beams used in the weighbridge weigh as little as 1200 lb on the 60 foot 60 ton scale and as much as 1800 lb on the 70 foot 60 ton scale. The 10 foot long crossbeam weighs about 200 lb and the two 7 foot long **end** cross braces weigh about 150 lb each. The small 7 foot long cross brace channels weigh about 75 lb each.

1. Weighbridge Assembly
   Block all suspension brackets in place so the beams will not shift or fall while the weighbridge is being assembled.

   Lower the main beams into place on top of the brackets, secure them in place with bolts but do not tighten until all parts are in their correct location.

   As soon as the second main beam is in place attach a cross brace to help hold the beams in place.

   Continue lowering the beams into place and inserting bolts. DO NOT tighten any bolts until all bolts are in place.

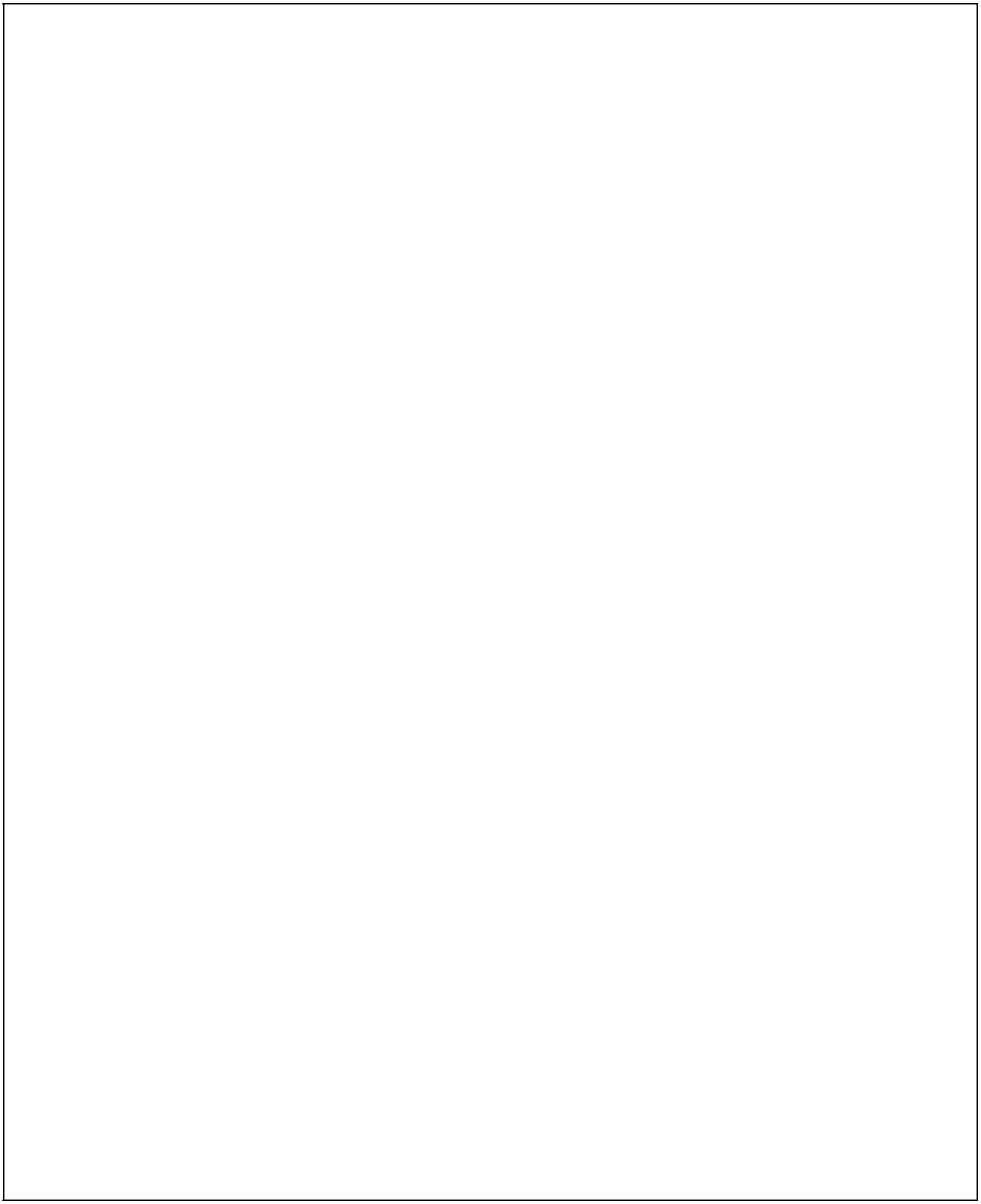


Figure 6.4

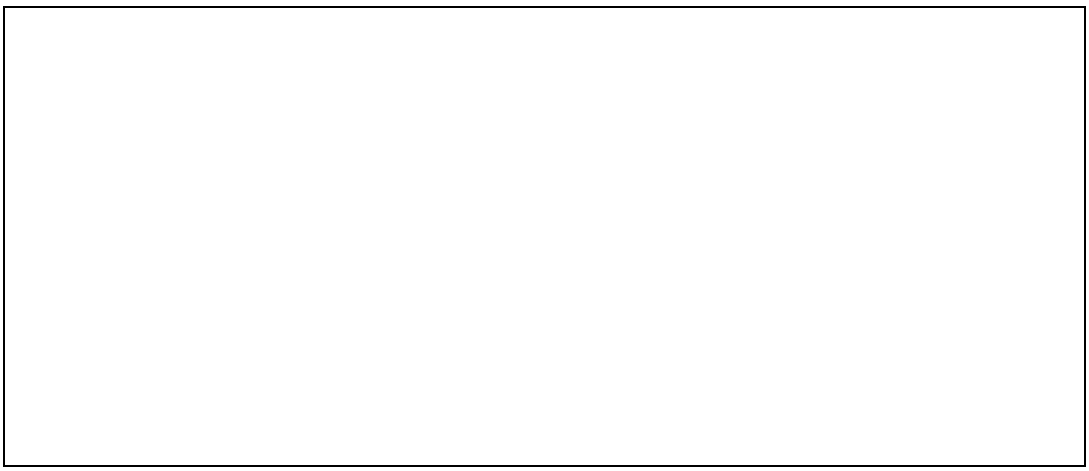


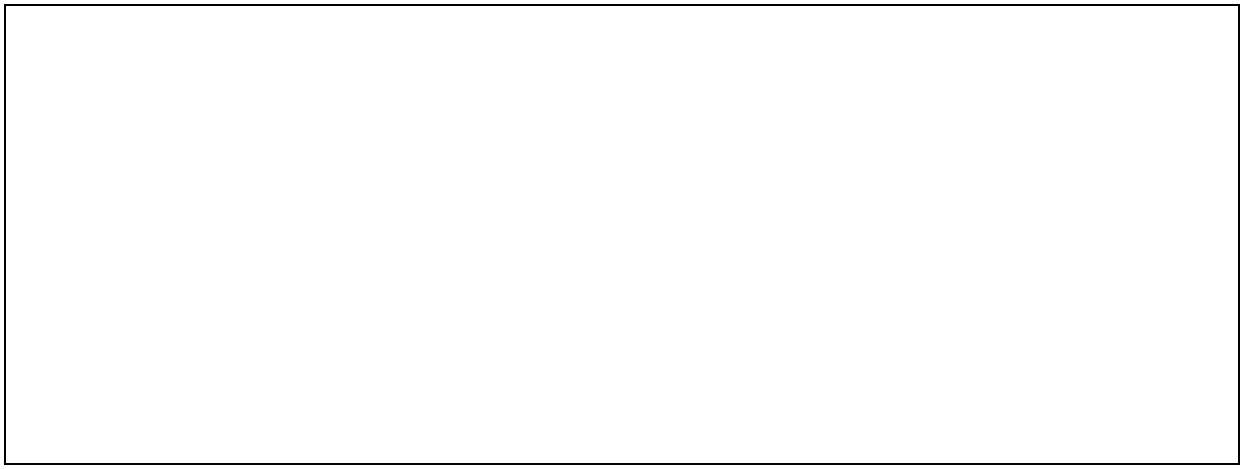
Figure 6.5 - Relative Location of Components

7.0 CONCRETE DECK CONSTRUCTION

1. The deck coping is 6 or 7 inch channel steel which is also used as the form when the concrete is poured. This channel supports the outside edge of the bottom of the concrete form and acts as a coping channel. It has a 3/8 x 1/2 steel bar at the top. This bar acts as a stone guard, and prevents stones from lodging in the gap where they can bind and cause scale errors. Channel to be set so that channel joint is at expansion joint.

   The deck coping must be held firmly in place as the concrete is poured and while it is curing. A nut is welded to the pit coping angle. The end of the bolt contacts the stone guard supporting the deck coping channel. It is adjusted to set the deck coping channel at the same height as the pit and coping angle. See Figure 7.1.

2. Weld the nuts to the pit coping angle about 3/4 inches from the top and space them about every 5 feet (see general layout drawings for spacing).



3. Set the channel in place. Adjust the bolts to set the top of the two copings so they are the same height. Weld the deck coping stone guard to the top end of the bolt. The bolts will be cut after the deck concrete has cured.

4. Weld the deck coping channels where they join to hold them in place.

5. Weld the deck coping channel to the weighbridge main beams, at the ends, and to the ends of the crossbeam on the sides of the platform. The weld must have 5/16 inch root cross section.

6. Corrugated sheet metal (28 ga., not provided with the weighbridge steel package) should be used for the bottom form of the deck concrete. The corrugation is to be laid flat across the weighbridge steel, and will be left in place after the concrete covers.. Particular attention should be made on the flatness of the corrugation over the splice plates shown in Figure 6.4. The corrugated forming must be supported from underneath as it cannot support the weight of wet concrete alone. No not allow corrugated to sag.

7. Reinforcing rods must be placed as shown on the general layout drawing. The reinforcing rods must be wire tied at as many intersections as needed to hold them in place while the concrete is poured and also during curing. See Figure 7.2.

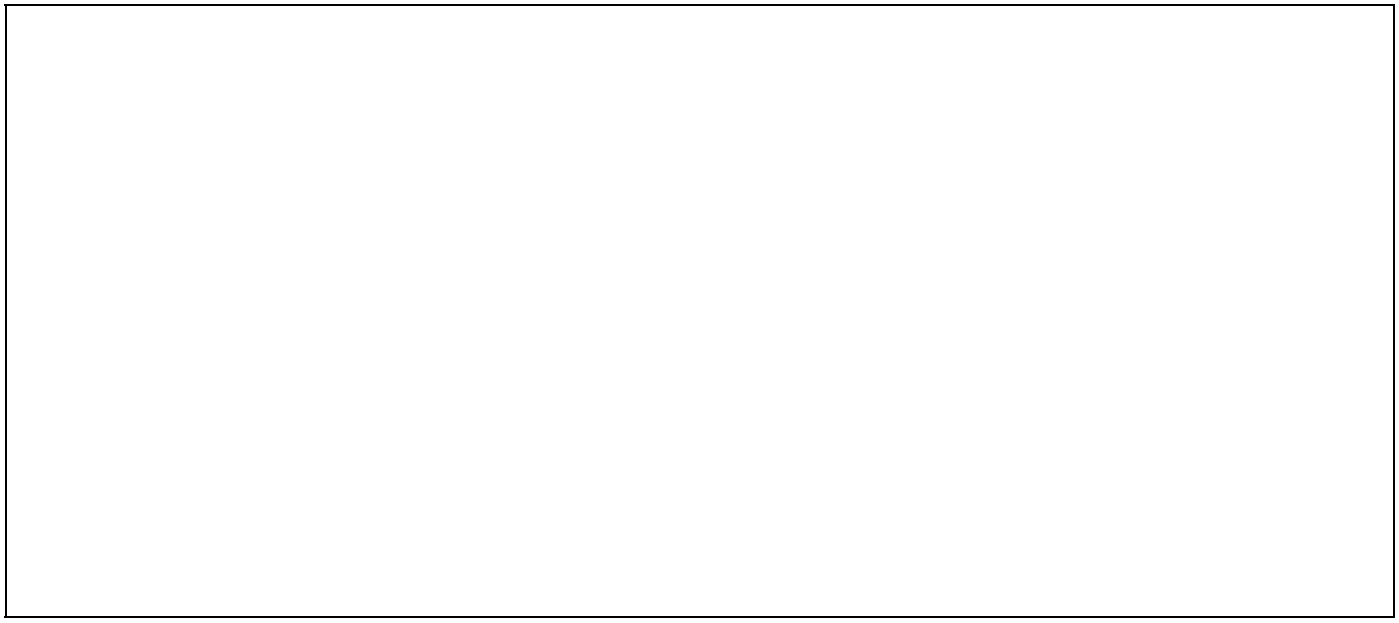


Figure 7.2 - Rebar Details in Platform

8. See the general layout drawing for the correct location of the expansion joint. Place expansion joint filler in the form. A form can be used to hold the filler in place while the concrete is poured. After the concrete is poured the form can be pulled out and concrete added to fill in the space. The deck channel joint must be at expansion joint.

9. Place the manhole in accordance with the general layout drawing, usually they are located near the drain sump or the sump pump. Some states require more than one manhole. Check state regulations for location and number required.

10. Pour the deck per the general layout drawings using concrete specified. Do not apply any vehicular loads during the full curing period or until the concrete meets specified strength. If the area is subject to frost, air entrained concrete must be used.

11. After the concrete has cured remove the shoring under the corrugated steel forming. With an acetylene cutting torch, cut out the bolts at pit coping gap.

12. Check alignment between deck and approaches. If any adjustment is needed do it before the grout is put in place.

13. Grout fulcrum stands and allow to cure before applying any load to the weighbridge. MAKE SURE THE GROUT FULY SUPPORTS THE STANDS, FILLING ALL VOIDS. Use EXPANDING TYPE grout as specified on drawings. EMBECO 636, POR-ROK EPOXY GROUT, or equivalent, to develop 37580 psi compressive strength.

14. Follow the grout manufacturer's instructions carefully. Some basic rules apply to all types:
    A. The area must be clean and free from loose materials, oil, and dirt.
    B. Soak the concrete with clean water for a period of several hours prior to pouring the grout.
    C. Build forms for the grout. Use grout in a flowable consistency and pour into form. It is important that grout reaches design strength before any load is applied to scale.
    D. Mix grout completely and do not add more water than is required as this will cause shrinkage.
    E. Ensure that the grout fully supports the entire plate.
    F. Grout can also be put in place in a plastic state. It must be forced under the fulcrum stands. This can be done with a wooden 1 x 4 about 2 or 3 feet long. Be sure the grout completely fills the space.

8.0 WIRING AND GROUNDING

8.1 WIRING (LOAD CELL TYPE ONLY)

It is absolutely essential that the load cell cable be installed correctly. It is equally important that all electrical parts be kept absolutely dry on the inside and as dry as possible on the outside. The load cell, connector, and the junction box (if used) are watertight; however, continuous exposure to moisture may cause corrosion which could eventually break-0down the seal and ultimately allow moisture to reach sensitive parts. Any moisture can cause drifting or zero change and degrade the accuracy of the scale. To insure easy installation and satisfactory operation the following procedures should be followed:

1. Mount the junction box so that the load cell cable enters the side or the bottom of the box. The box should have the surface with no holes in it at the top to reduce the possibility of water entry.

2. Conduit to indicator. Once inch metal rigid metal conduit must be used for the cable connecting the instrument to the scale pit. Each cable must be in its own conduit. Do not attempt to run more than once cable in any conduit. Instruments will interfere with each other if they are connected to multiple load cell cables in a common conduit.

3. On one of the mounting feet connect the braided ground wire to the outside of the junction box. Do not run the braided ground wire inside the junction box. It cannot be sealed completely since air and moisture can pass between the wire braids.

4. Make sure that all connections into the junction box have pipe joint compound on them and that they are tight. Unscrew any plugs that were not previously removed. Coat with pipe joint compound and replace. Again, make sure they are tight.

5. Tighten, but do not over tighten the cover bolts. Over tightening can warp the cover forcing the gasket out of place. A silicone sealant (provided) will ensure the integrity of this joint.

8.3 SURGE VOLTAGE PROTECTION

For Applications to be installed with Mettler Toledo's Surge Voltage Protection Kit, refer to the Surge Voltage Protection Guide (TM000913I00, or latest revision) for specific instructions. In order to put the surge protection warranty into effect, the certificate contained in the surge guide must be returned to Mettler Toledo's Warranty Administration Department.

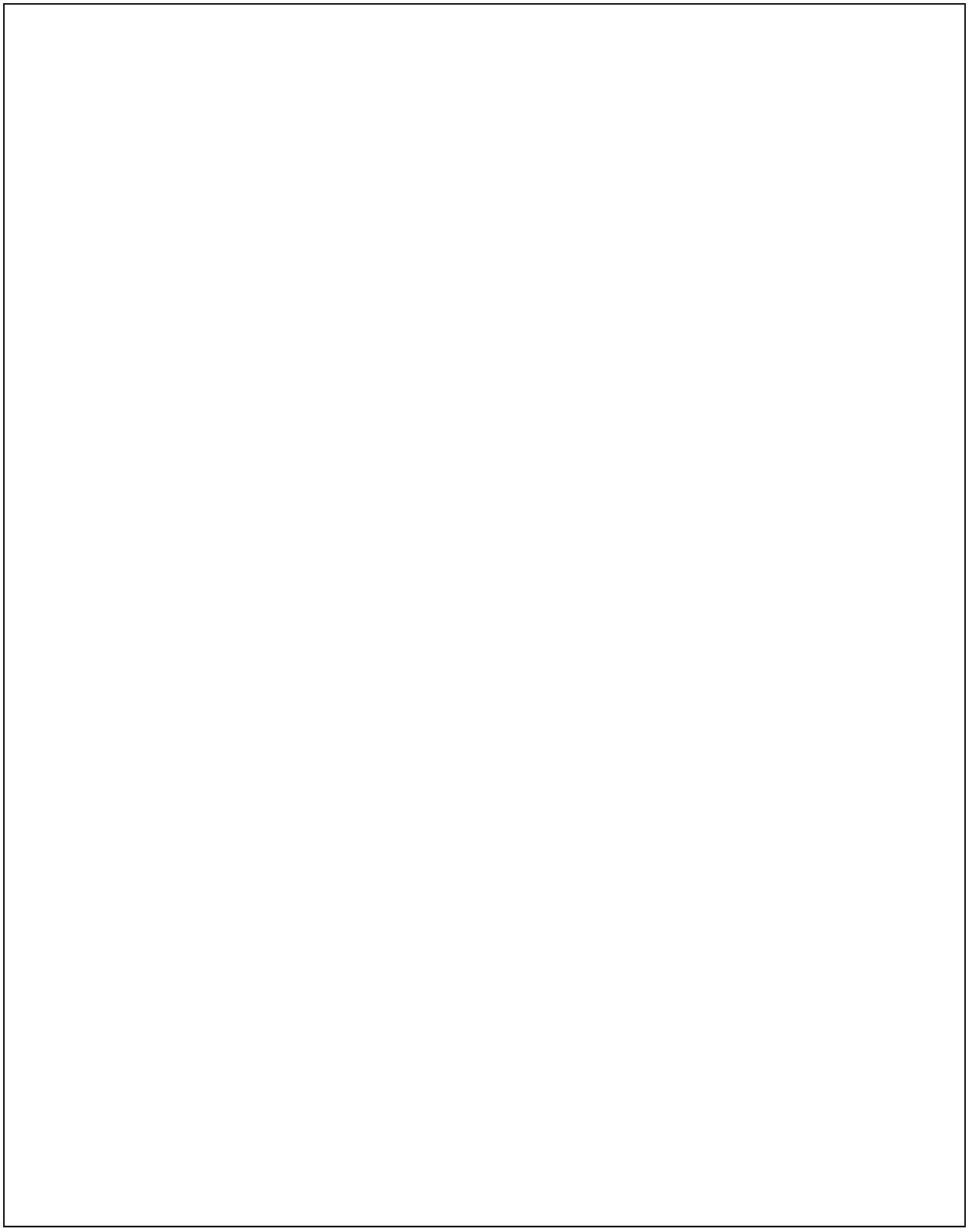


Figure 8.1 - Wiring and Grounding

CAUTION!!

All electrical welding on or around the scale should be completed before the electronic parts are installed.

The welding circuit ground clamp must be connected to the steel member being welded/ The high amperage welding current must not pass through any electronic parts.

8.2 GROUNDING (LOAD CELL TYPES ONLY)

Grounding of the Model 2894 Pit Type Truck Scale is important for several reasons. Most importantly is safety. Electrical devices of this type must be grounded to protect the operator and others that come in contact with it. Grounding details are shown in Figure 8.1.

Grounding will help the scale operate more accurately. A good ground system used in conjunction with a surge voltage protection system will minimize the causes of damage due to transient surge voltages.

Methods for obtaining a good ground:

1. The very best ground available is the concrete reinforcing bars in the scale foundation. The bars form a grid consisting of longitudinal and transverse bars tied together with #15 (min,) wire tied extending the full length and width of foundation. This grid is connected to the fulcrum stands through the anchor bolts. The bars have a large surface area and the concrete below the surface of the earth has a high concentration of moisture. These factors contribute to a very effective, low resistance ground connection. All anchor bolts are connected to the foundation reinforcing bars via wire ties. This grid provides the maximum surface area available for dissipation and is superior to techniques using only ground rods.

2. All component parts of the scale are connected together with wired, metal conduit, or a metal frame to form a continuous metallic low resistance path which shunts unwanted stray electrical currents. This is more effective than several ground rods that may exhibit a high resistance to ground and can introduce unwanted electrical currents into the sensitive electronics of the scale system causing inaccuracies or permanent damage. Details of transient surge voltage protection can be found in Mettler Toledo's Surge Voltage Protection Guide.

3. Rigid metal consult buried in a trench along side a #6 copper ground wire is the metal conduit for load cell cable. The metal conduit protects the load cell cable from unwanted electrical interference, keeps the cable dry and the #6 copper ground wire provides a good ground connection between the instrument, the junction box, and the load cell. Plastic pipe must **NEVER** be used for load cell cables.

9.0 CALIBRATION PROCEDURE

1. Drive the test truck across the scale three (3) times in both directions to seat all mechanical parts.

2. Calibrate the scale. Set zero and span to within a few graduations. Do not spend time making an exact span setting at this stage.

   The instrument can be pre-calibrated with a load cell simulator. TO do this the lever ratio must be known. The ratio of the main levers is 10 to 1. The ratio of the short transverse lever used with a load cell is 15 to 1, the lever is about 4-1/2 feet long. The total ratio will be 150 to 1, to the load cell. The long transverse, lever used with a beam, has a ratio of 40 to 1, this lever is about 12 feet long. The used of this lever would result in a total ratio of 400 to 1.

3. Check for repeatability and zero return. This may be accomplished by bringing the truck to precisely the same position near the center of the platform each time. Drive the truck on and off the platform three (3) times, recording the truck weight and the return to zero value tracking time (it is recommended that auto zero tracking be disabled at this time). These readings must be within one graduation of each other. If they are not, interference or misalignment exist and must be corrected before preceeding.

   DO NOT LEAVE THE TEST TRUCK ON THE PLATFORM FOR MORE THAN TEN MINUTES.

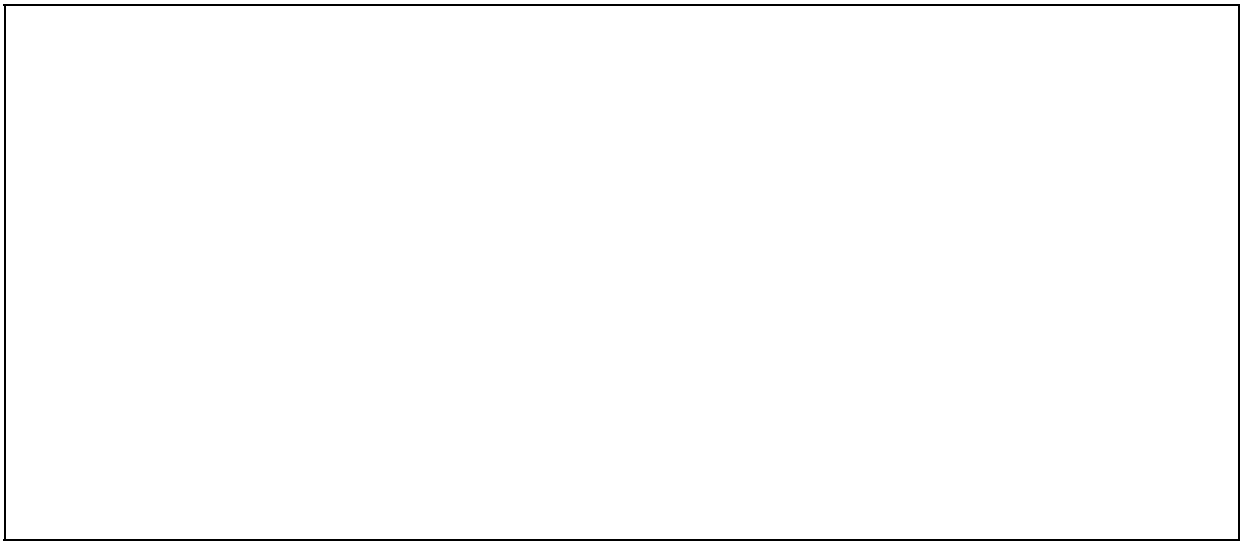


Figure 9.1 - Testing Procedure

4. SHIFT ADJUSTMENTS
   To check the scale for shift error first drive the test truck across the scale several times in both directions. Then stop the test truck with the load concentrated over each main lever, record the weight reading at each point. Take several readings to prove there is no friction. See Figure 9.1.

   If the shift is correct, all readings will be the same. If the readings are not the same, a shift adjustment is necessary and the main lever nose irons must be adjusted to correct the error.

   Before making may adjustments, mark the position of the nose iron on the main lever. This can be done with a chisel or scriber. This will give a reference point from which to work. Figure the shift adjustment that required the least amount of adjusting. By keeping shift adjustment to a minimum and as minor as possible, there is less chance that the lever connections will set out of of plumb. Lever connections must remain plumb. Lever connections must remain plumb otherwise adjustments will have no (or opposite) results to that which is expected.

EXAMPLE:
Test Truck weight 20,000 pounds

Section A	20,000 lb
Section B	20,020 lb
Section C	19.960 lb
Section D	19,960 lb
Section E	19,960 lb

As shown in the example C, D and E are alike. Adjust A and B to make them read the same as C, D and E, then adjust the nose iron on the transverse lever to bring the scale to the weight of the test truck, or adjust the span if an electronic instrument is used.

NOTE: When making a nose iron adjustment, the rule “Lengthen to Weaken, Shorten to Strengthen” applies. See Figure 9.2.

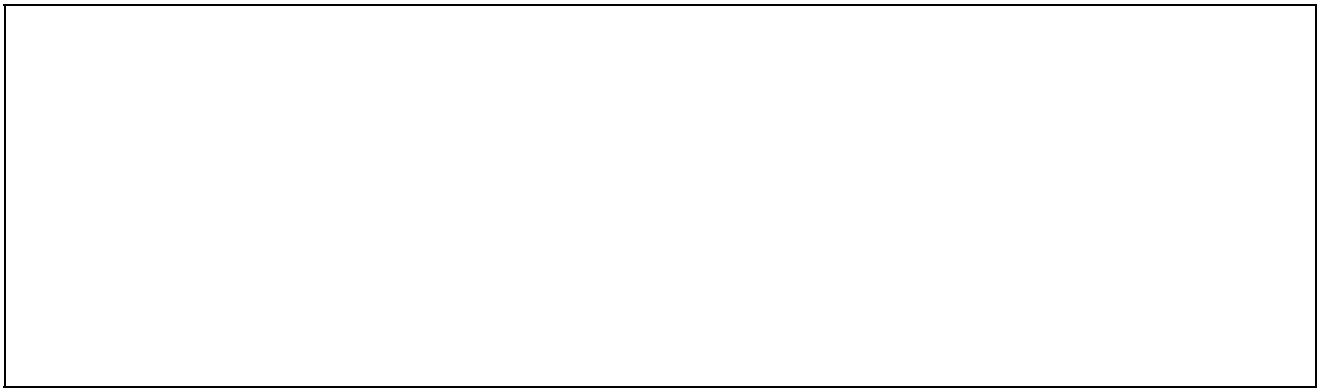


Figure 9.2 - Adjusting Nose Pivot

To adjust the nose pivot on the main lever, or the transverse lever first loosen locking bolt, then with a brass drift and a medium size hammer or a soft face hammer move the adjustable nose pivot part of the lever. Tighten lock bolt, check zero, adjust zero if necessary and test. It may be necessary to repeat the steps several times to get it correct. Figure 9.2.

To adjust for 20 lb. With a test weight of 20,000 lbs. Or 1 part in 1000 error move the adjustment approximately 1/16 of an inch or 68 one-thousandths of an inch (.068 inches).

Adjust the load off scale platform. Usually it is not necessary to jack up the nose o the lever to adjust. DO NOT strike the lever parts with a hard face hammer as this could cause damage making it impossible to move them, To calculate the distance the nose pivot must be moved, divide the test weight in pounds by the error weight in pounds then divide the lever length in inches by the resultant, the answer will be the distance the picot should be moves.

The lever length will be the distance from the fulcrum to the nose pivot to the pivot that is being adjusted. See Figure 9.3.

EXAMPLE:

GIVEN: Test weight = 20,000 lb
Error weight = 20 lb
Lever pilot weight = 67.50 inches (2894)

20,000 divided by 20 = 1000
67.5 divided by 1000 = .0675
0.068 is the distance in inches the nose pivot must be moved. (.0625 is 1/16 of an inch)

Repeat the above tests until all sections read the same. Remember that the connections between the levers must always remain plumb.

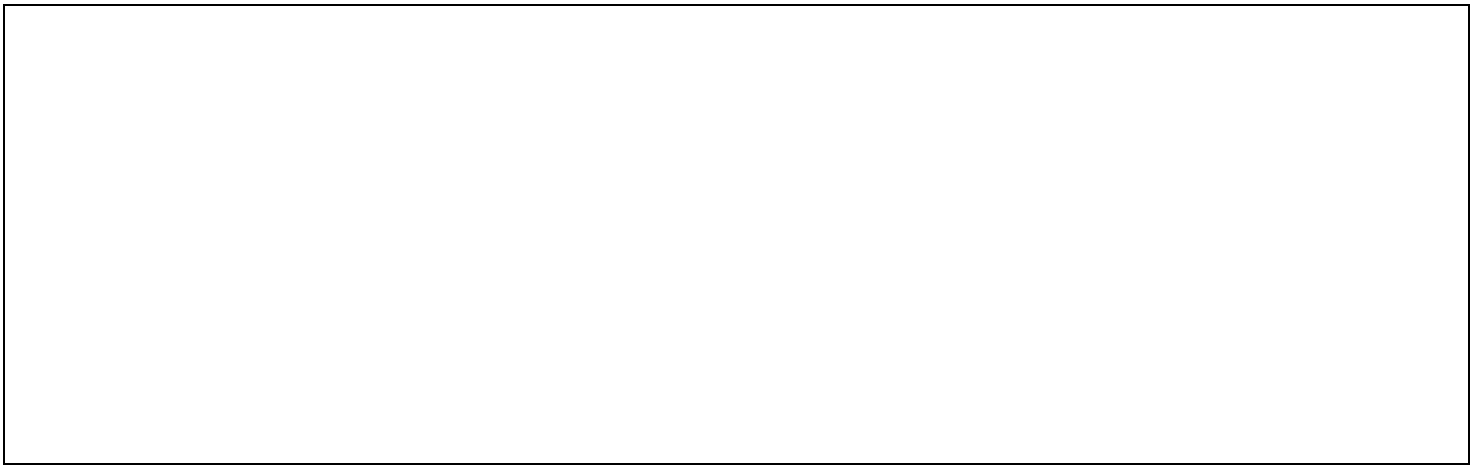


Figure 9.3 - Measuring Pivot Distances

5. CALIBRATION
    1. Set approximate span with load cell simulator, if it hasn't been done.
    2. Place 20,000 pounds of test weights on platform.
    3. Adjust indicator to read 20,000 pounds. Adjust span pot if electronic or nose iron if beam.
    4. Remove test weights. Check zero adjust of necessary. Do not place weights on the truck.
    5. Drive empty truck on scale and record reading.
    6. Remove truck, scale will return to zero.
    7. With truck off the scale, load the 20,000 pounds of test weights back on truck.
    8. Drive truck with 20,000 pounds of test weights on scale. Adjust indicator to read weight of empty truck (per #5) plus 20,000 pounds.

6. LINEARITY
   Place the 20,000 pounds of test weights on the scale in 3,000 pound increments and record the indication for each 3,000 pound increment. The deviation of the indicated weight from the test weight must be within 0.1 percent of the test weight. Non-linearity is almost always due to misalignment of suspension elements (Figures 5.1 and 5.2) and linkages. The load cell is rarely a problem unless showing other signs of instability.

7. FINAL CLOSURE OF JUNCTION BOX
   After hookup is complete carefully deal the junction box against moisture. Use RTV compounds wherever cable enters junction box. Place the dehumidifier package in the box. Make sure the desiccant is in an active (dry) condition. Apply sealing grease, (provided) to both sides of the gasket and assemble the gasket to cover. Attach cover to box, making sure that the grease does not become contaminated. Tighten cover bolts securely. Be careful, DO NOT over tighten the bolts as this could warp the cover or force the gasket out of place.

8. Record indicator readings for given simulator settings. (See Appendix F). This data can be used a quick check on instrument accuracy when trouble shooting.

   FAILURE TO SEAL JUNCTION BOX AND MAINTAIN MOISTURE INDICATOR IN A BLUE CONDITION WILL CAUSE SERIOUS SCALE ERRORS.

   Inform the customer of the need to periodically check the moisture indicator.

10. APPENDIX A.1- CAPACITY OF TRUCK SCALE FOR TYPICAL TRUCKS

11.0 APPENDIX A.2

Present day Mettler Toledo rates at 35,000 lb per tandem axle are designed to the same weight limits as the nation's highway bridges. Consequently. The bridge formula can be used to determine if a particular truck is within the design limits of the scale weighbridge.

Gross Weight Allowable under Federal Law Formula Enacted January 4, 1975.

$$W = 500 \left(\frac{LN}{N-1} + 12N + 36 \right)$$

W = Maximum weight in pounds carried on any group of two or more axles computed to nearest 500 lb.
L = Distance in feet between the extremes of any group of two or more consecutive axles.
N = Number of axles in group under consideration.

EXAMPLE: 5 Axle Semi Truck Trailer

There is 10 feet between the steering axle and the first drive axle. There is 5 feet between the first drive axle and the second drive axle. There is 30 feet between the seconds drive axle and the first drive trailer axle. And, there is 5 feet between the first trailer axle and the second trailer axle. Therefore, the distance in feet between the extremes of any group of two or more consecutive axles (L) is 50 feet.

N = 5

$$L = 50 \qquad \left(\frac{50 \times 5}{4} + 60 + 36 \right)$$

158.5 x 500 = 79,250 = 79,000 rounded to the nearest 1000 lb.

Then take the tractor only

N = 3

$$L = 15 \qquad \left(\frac{15 \times 3}{} + 36 + 36 \right) \qquad = 94.5 \times 500 = 47,250 \text{ lb}$$

47,000 lb would be the maximum weight allowed for that part of the truck.

For this example we calculated the maximum weight for two parts of the truck. If this were an actual truck it would be necessary to calculate combinations to be sure that no part of the truck, or the complete truck exceeds the limits.

12.0 APPENDIX B - 2894 INSTALLATION SCHEDULE

STEP	RESPONSIBILITY	EQUIPMENT OR TOOLS REQUIRED
A Site Selection	Owner, with Mettler Toledo Recommendations	Plans, Drawings for scale and proposed site.
B Pit Construction 1. Obtain appropriate drawings for this installation 2. Excavate 3. Lay Stone (if needed) 4. Form Pit Floor 5. Place Rebars 6. Pour Concrete 7. Form Pit Walls 8. Pour Concrete 9. Cure Concrete	 Back Hoe Contractors	 Forms Hand Tools Concrete (See Chapter 4)
C Lever Installation	Mettler Toledo/ Distributor or Contractor	Test Truck with boom or hoist for levers, Hand tools. (See Chapter 5)
D Assemble Weighbridge	Contractor	Test Truck with boom (See Chapter 6)
E Concrete Deck Construction 1. Form 2. Pour Concrete	Contractor	 Electric Welder Concrete (See Chapter 7)
F Connect Wiring	Mettler Toledo/ Distributor or Contractor	Hand Tools (See Chapter 8)
G Calibration	Mettler Toledo/ Distributor	Test Truck with Weights (See Chapter 9)
H Approval	Weights & Measures Mettler Toledo/ Distributor	Test Truck with Weights

Each step must be completed in sequence before the next step can be started.
*It is not necessary to wait the full curing time before going to the next step, but the full curing time must be allowed before loading the scale for calibration.

13.0 APPENDIX C - BOLT AND WRENCH SIZES AND TIGHTENING SPECIFICATIONS

Bolt Location	Bolt Size	Wrench Size	Tightening Method
Weighbridge Bolts	7/8	1-7/16	Twist Off **
Suspension Bracket	5/8	1-1/16	Turn-of-Nut* (half turn)
Anchor Bolts	3/4	1-1/8	Turn-of-Nut* (1/4 turn)

* Turn-of-Nut Tightening
The turn-of-nut method is used to provide the bolt tension required. First, all bolts shall be brought to 'snug tight' condition to insure that the parts of the joint are brought into contact with each other. "Snug tight" is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, all bolts in the connection shall be tightened additionally one half turn (except A307 bolts which shall be one quarter turn), with tightening progressing systematically from the most rigid part of the joint to its free edges. During the operation there shall be no rotation of the part not turned by the wrench.

** Twist-off Tightening
The weighbridge bolts have a special twist off head and use a special socket for the bolt head. The 1-7/16 wrench is to hold the but from turning.

14.0 APPENDIX D - BOLT AND NUT IDENTIFICATION

15.0 APPENDIX E