

The customer is responsible for all site work, uplift connections and 4x4 runners. Please use these instructions.

Why use sonotubes/piers instead of a slab? Sonotubes, an economical, cylindrical cardboard form for pouring concrete piers, is a better choice for sloping sites, to reduce the amount of earthmoving and grading required. It is also a good choice if the customer wishes to have a wood frame floor in their building so they can have access beneath it to add plumbing or wiring later. Some homeowners also do this so they can install rigid insulation between the joists as well.

Can I do this myself? Constructing a proper foundation requires skill, experience and patience. Improper site preparation or poor concrete mix can result in a pile of concrete monuments, instead of a solid foundation that will add decades to the building's lifespan. Concrete foundations are a job best left to qualified professionals. The following guidelines are so the homeowner can be familiar with the process and also to guide their professional with the correct specifications for our buildings. If you do it yourself, use all proper safety equipment, such as glasses, gloves, dust mask, footwear, helper, etc.

How many sonotubes does my building need and how are they constructed? The following pages contain a detailed spec sheet and section views of the sonotube piers and bell footings, and a separate layout sheet for each building size showing the number and placement of tubes. The depth below natural grade varies by state, so *check with your Town's code enforcement office for this depth requirement.* (Some approximations: most of MA, NH, ME, VT & northern NY require 4ft below grade, NJ & CT may be 36"-42" below grade, VA & MD are between 24"-30" below grade.)

Why do I need so many, and why can't I use 8" diameter tubes? It all has to do with the design weight of the building and the bearing properties of the soil. Sandy & gravel soils have a bearing resistance of approx. 3,000 to 5,000 lbs/sf. Clay soils vary from 1,500 to 2,000 lbs/sf. The weight of the building is calculated as the combined dead loads plus live loads. 10" diameter sonotubes will support the building in most sandy & gravel soils, 12" diameter tubes in most clay soils. 8" tubes simply don't have the footprint to keep from sinking, except on bedrock, or with "bell" footings. Some poorer soils may even require "bell" footings. See **Figure 3** example.

How do I lay out the hole locations? Construct "batter boards" as shown in **Figure 1**, with the four outside tubes being located where the taut strings cross. Use the 3-4-5 (6-8-10) geometry rule to assure a squared layout. Verify your accuracy by making sure your diagonals are equal. Measure from these locations along the string to the other hole positions, and mark the ground with a large 'X' at each spot. Make the X's approx 3ft wide, so you can see them after you start digging.

What's the best way to dig the holes? A track BobCat with a 12" hydraulic auger attachment is the best all-around method for any site access, minimizing site impact & backfilling, and for speed in getting the holes dug. See **Figure 2**. This type of machine or similar unit can be rented from many equipment rental centers. You may also dig them by hand (a strenuous process), or use a backhoe (which makes a larger hole and much more site work). Laying down tarps around the work area to catch flying soil will make clean-up easier. Remove the strings from your batter boards and replace them after the excavating is done.

Set your sonotubes, set them firmly in the holes and cut the tops level, using a laser or string level and a hand saw to trim them. **DO NOT BACKFILL** until you have had your building inspector sign off on the open hole inspection. If rebar is req'd in your area, see **Figure 4** for installation. Use some tie wire thru two opposing holes. Make certain the bottom of the rebar is supported at least 2"-3" from the bottom and sides of the bell.

After inspection, carefully shovel clean backfill by hand around the tubes, making sure no large rocks or wet, heavy soil is used, or the forms may be damaged. Compact the fill around the tubes at least every 12" before adding more. You should either put temporary bracing on the tubes to hold them from moving, or go carefully and recheck that they remain level and plumb. See **Figure 5**.

Should I buy concrete from a batch plant or mix up bags myself? A ready-mix concrete plant can assure that the mix you get will meet the strength requirements and save the time & labor of mixing it all yourself (Minimum strength 3000lb, 4"-5" slump). If you are mixing your own, use Sakrete Concrete Mix 4000lb or Sakrete Contractors 5000, **DO NOT USE** the "quick" kind you pour in the hole and add water afterwards. Save your arms & back by renting a small portable concrete mixer from Home Depot or other equipment rental center. Some of these have plastic barrels for easy clean-up, are sized to mix one bag at a time and will fit in the back of an average SUV. **CRITICAL MIXING INFO:** Follow instructions on the bag and **DO NOT** add more than the allowable amount of water. The less water you use and still "wet" the mix ingredients, the stronger the finished product will be. The most common cause of concrete failure is adding too much water to make it easier to mix, which results in weak, crumbling concrete.

How much concrete will I need? A 10" sonotube requires approx. .545 cu. ft. each (.9 80lb bags of concrete mix for each linear foot), and 12" sonotubes require approx. .785 cu.ft. per linear foot. (1.3 80lb bags of concrete mix per linear foot). For an installation in the northern regions (4ft frost depth) the sonotube would be a minimum of 4 linear feet. In this example, a 16x24 building, which needs 15 footings, would require 3.6 80lb bags for each footing, or a total of 54 bags of mix (1.2 cu.yds.) See note next to **Figure 3**, if you are using 8" tubes with Bell footings.

Shovel the mixed concrete into the braced sonotubes, using a sonotube sawed lengthwise as a trough. If you have a concrete truck and can't drive to the site, have at least two helpers with wheelbarrows to run between the truck & site while you dump it into the tubes. Every 16" maximum of fill height, use a rod or mechanical vibrator to vigorously tamp the wet concrete down to the bottom to remove air voids. Fill each tube to the level, tamping as you go, and smooth trowel the top. A void can cause failure and/or severe shrinkage. Once you start pouring any one tube, make certain you have enough concrete to finish that tube. Stopping for lunch before you finish a tube can result in a "cold joint", which can easily fracture or separate.

Place your anchor bolts into the wet concrete, using your string line to locate them accurately. You can use wire to hold them in place while the concrete sets up. (Alternately, you could drill in 1/2"x6" Titen HDG screw anchors after the concrete is cured instead.)

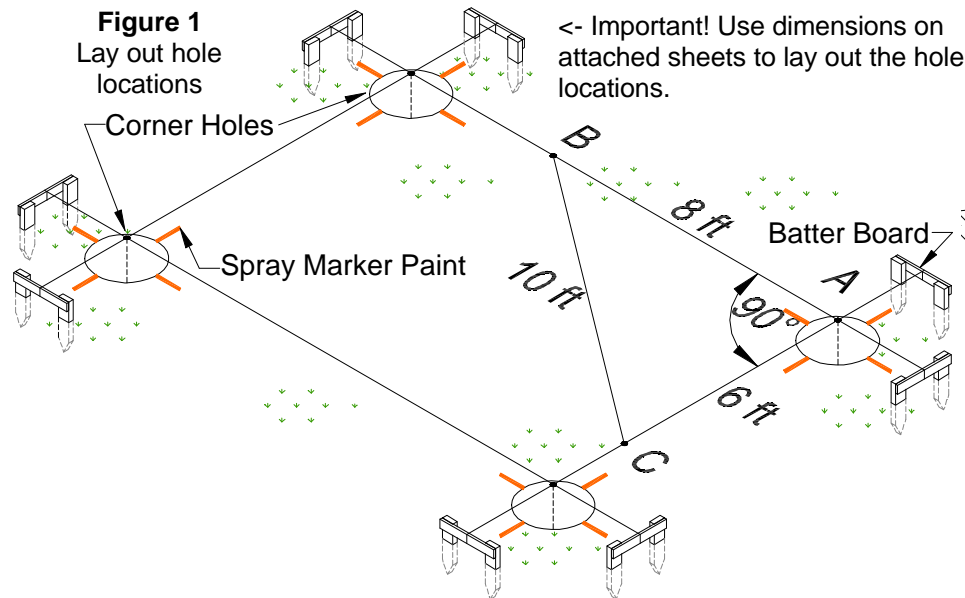
Allow 7 days for the concrete to cure before building. Concrete reaches its minimum strength in about 7 days when properly cured. Unprotected, the outside dries out first, causing cracking and weakening the pier. In hot weather, cover each tube with a piece of wet burlap and a sheet of plastic weighted at the corners with rocks. Re-wet as necessary. In cold weather, cover with plastic weighted at the corners and loosely pile hay or other insulator over it. After 7 days, remove the material and strip the exposed part of the sonotube cardboard.

Install the U-brackets using a string to check both alignment and level, since concrete may shrink slightly after curing, use large galvanized washers or plates as shims under the brackets, if req'd, to get them all level with each other, then tighten down the washer & nut. If any of the anchor bolt sticks above the U-bracket seat, grind or cut off the excess, so it doesn't interfere with the 4x4. Supply a Strongtie H2.5A hurricane tie for each sonotube, with galv hanger nails to attach it.

You must supply and install your own 4x4s as noted on the layouts, or buy them thru us. Let your Customer Service Rep know how you wish to proceed. (4x4 runners are not normally included in the shed package)



Figure 2



<- Important! Use dimensions on attached sheets to lay out the hole locations.

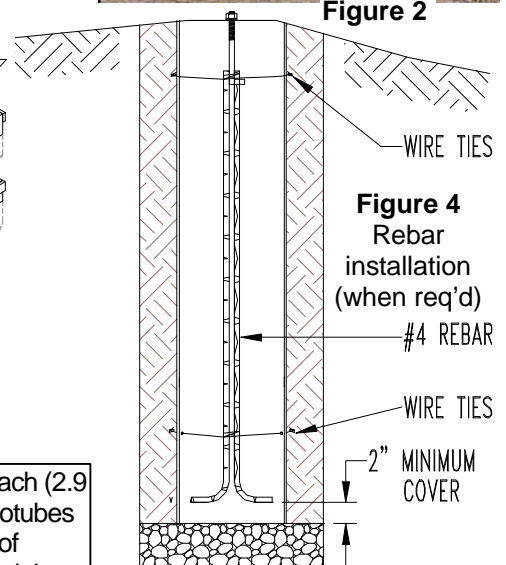


Figure 4
Rebar installation (when req'd)

<- A Bigfoot® bell footing requires approx. 1.75 cu. ft. each (2.9 80lb bags of concrete mix for each bell), and the 8" sonotubes require approx. .349 cu.ft. per linear foot. (.6 80lb bags of concrete mix per linear foot). This bell footing is 14" in height. Volume required for other bell footing forms may vary.

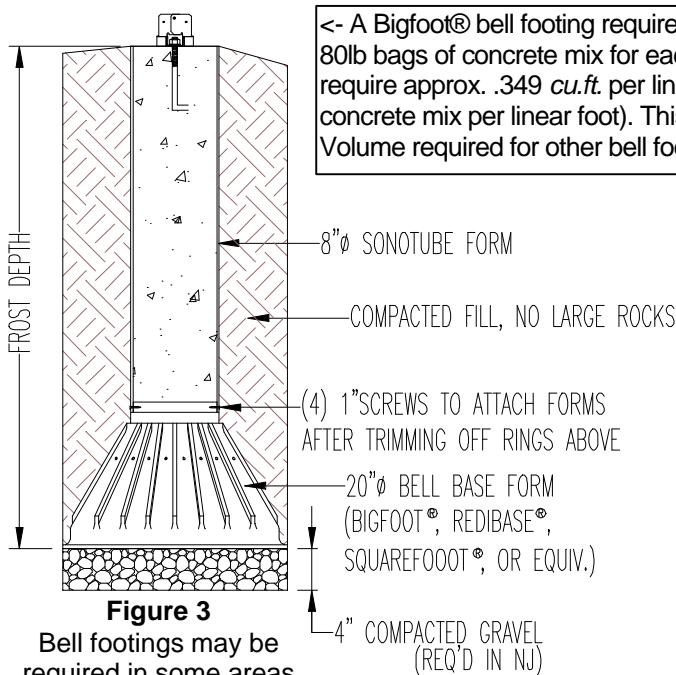


Figure 3

Bell footings may be required in some areas due to soil conditions.

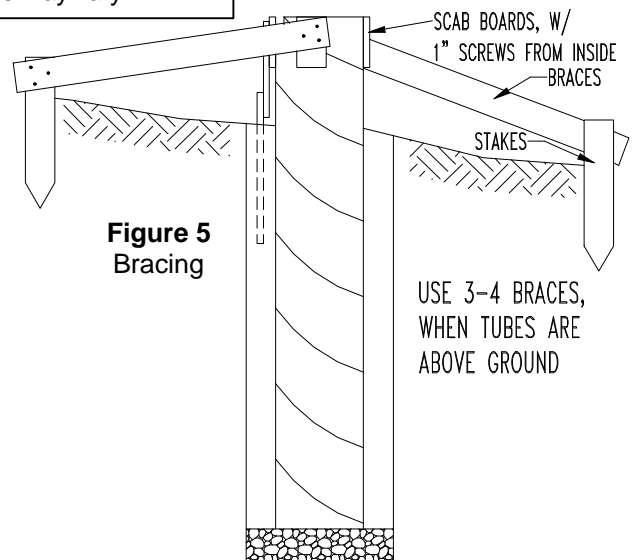


Figure 5
Bracing

USE 3-4 BRACES, WHEN TUBES ARE ABOVE GROUND

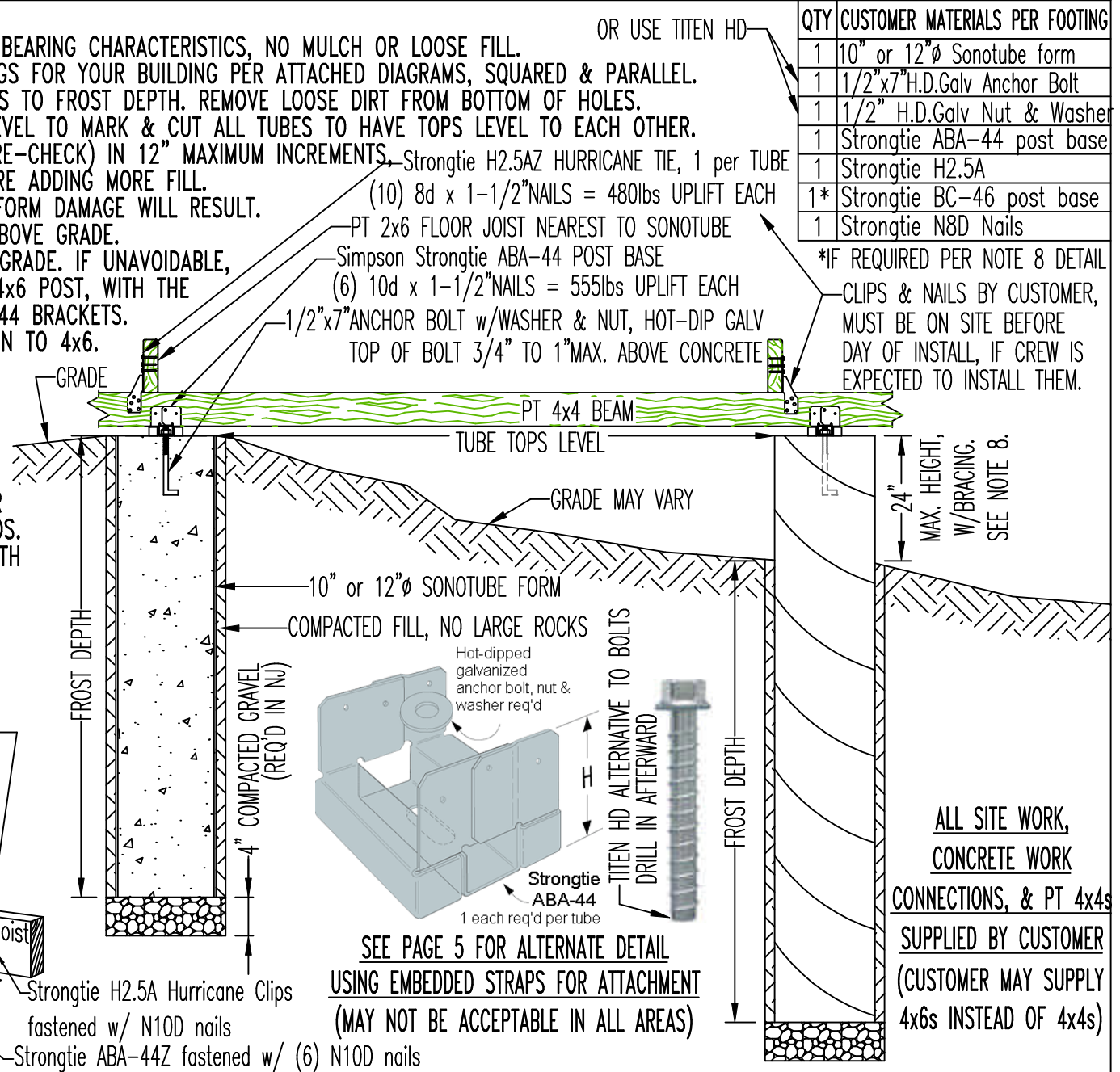
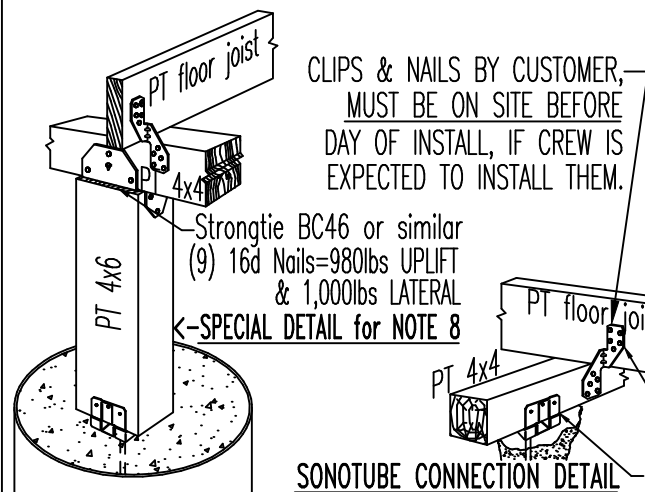
CONCRETE & SITE PREP:

1. SOIL MUST BE UNDISTURBED & HAVE SUITABLE BEARING CHARACTERISTICS, NO MULCH OR LOOSE FILL.
2. LOCATE & MARK OUT THE QUANTITY OF FOOTINGS FOR YOUR BUILDING PER ATTACHED DIAGRAMS, SQUARED & PARALLEL.
3. USING AN AUGER OR OTHER METHOD, DIG HOLES TO FROST DEPTH. REMOVE LOOSE DIRT FROM BOTTOM OF HOLES.
4. ASSEMBLE FORMS AND SET IN HOLES, USING LEVEL TO MARK & CUT ALL TUBES TO HAVE TOPS LEVEL TO EACH OTHER.
5. BACKFILL CAREFULLY (TEMP BRACE FORMS OR RE-CHECK) IN 12" MAXIMUM INCREMENTS, COMPACTING FIRMLY AROUND TUBE FORMS BEFORE ADDING MORE FILL.
6. DO NOT USE ROCKS OR HEAVY, WET FILL, OR FORM DAMAGE WILL RESULT.
7. BRACE ANY SONOTUBE FORM WHICH EXTENDS ABOVE GRADE.
8. NO TUBE MAY EXTEND MORE THAN 24" ABOVE GRADE. IF UNAVOIDABLE, TERMINATE TUBE NEAR GRADE AND INSTALL PT 4x6 POST, WITH THE TOP OF POST LEVEL TO SEATS ON OTHER ABA-44 BRACKETS. CUSTOMER MUST PROVIDE ALTERNATE CONNECTION TO 4x6.
9. CONCRETE MIX MUST BE 3,000 LB MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS.
10. LOCATIONS EXPOSED TO FREEZING & THAWING DURING CONSTRUCTION MUST USE AIR-ENTRAINED MIX, 5%min, 7%max.
11. PLACE CONCRETE SLOWLY, TAMPING W/ ROD OR MECHANICAL VIBRATOR TO REMOVE ANY AIR VOIDS.
12. EMBED ANCHOR BOLTS, CENTERED IN TUBES, WITH 3/4" - 1" MAX EXTENDING ABOVE CONCRETE. SECURE IN PLACE TO PREVENT MOVEMENT.
13. CURE CONCRETE FOR MINIMUM OF 7 DAYS BEFORE BUILDING OR APPLYING LOADS.

OR USE TITEN HD

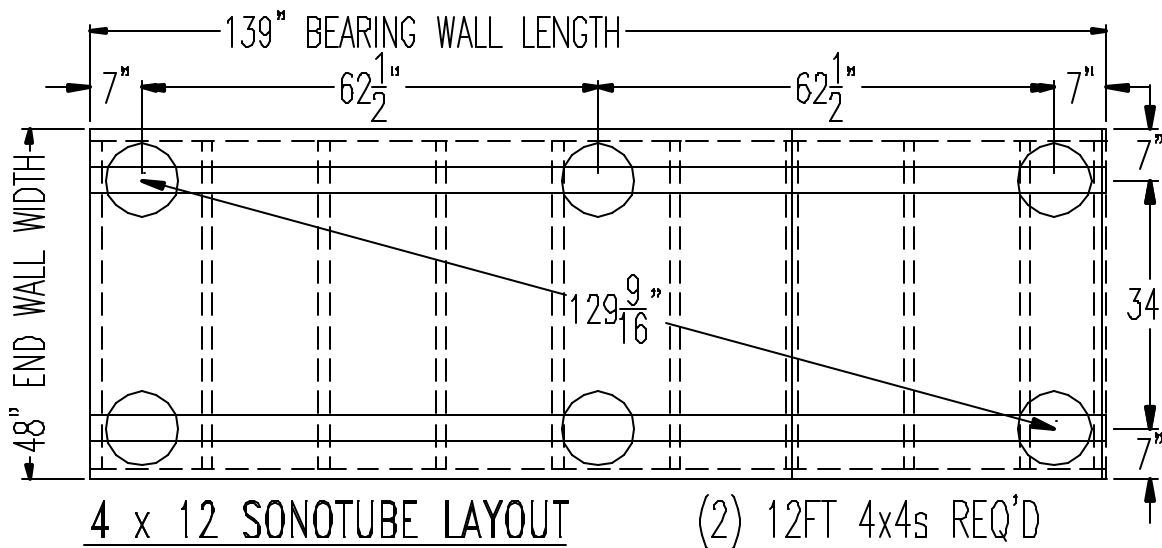
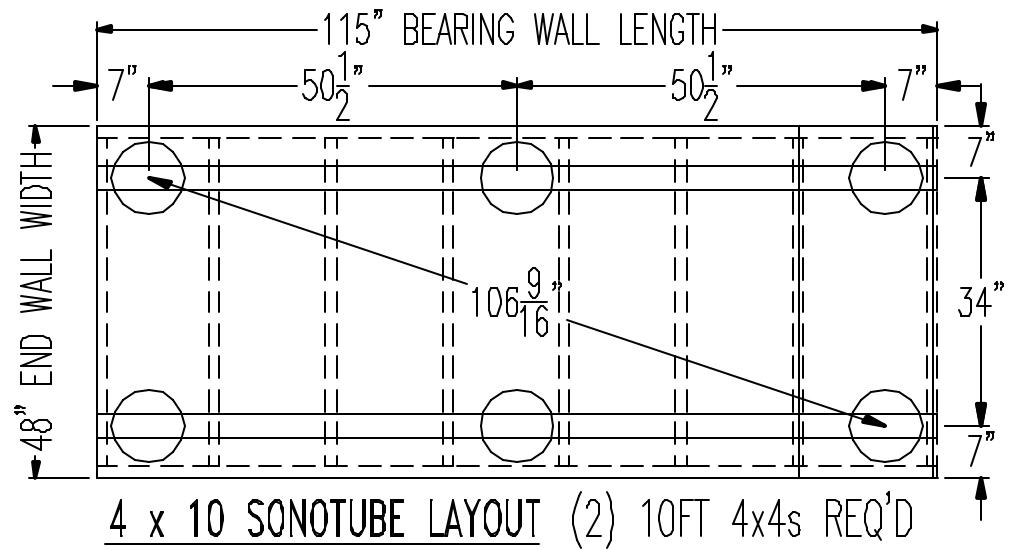
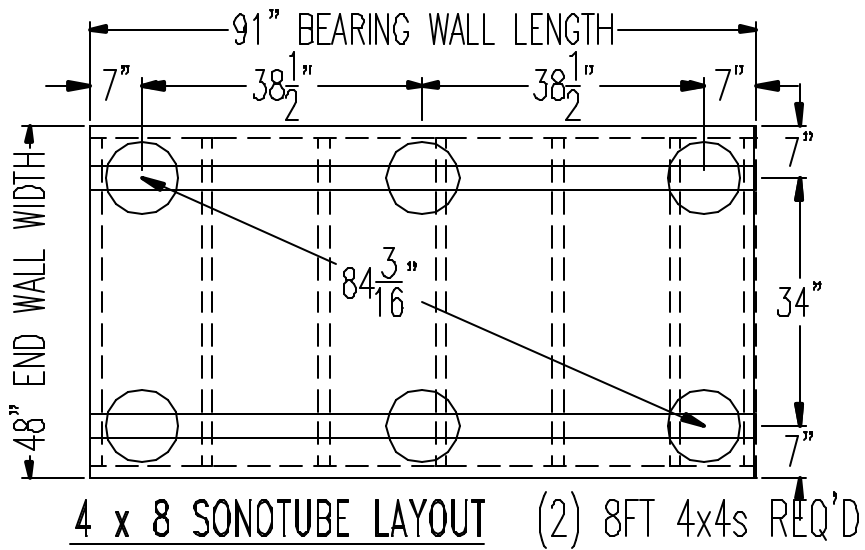
QTY	CUSTOMER MATERIALS PER FOOTING
1	10" or 12" ϕ Sonotube form
1	1/2"x7"H.D.Galv Anchor Bolt
1	1/2" H.D.Galv Nut & Washer
1	Strongtie ABA-44 post base
1	Strongtie H2.5A
1*	Strongtie BC-46 post base
1	Strongtie N8D Nails

*IF REQUIRED PER NOTE 8 DETAIL
CLIPS & NAILS BY CUSTOMER, MUST BE ON SITE BEFORE DAY OF INSTALL, IF CREW IS EXPECTED TO INSTALL THEM.

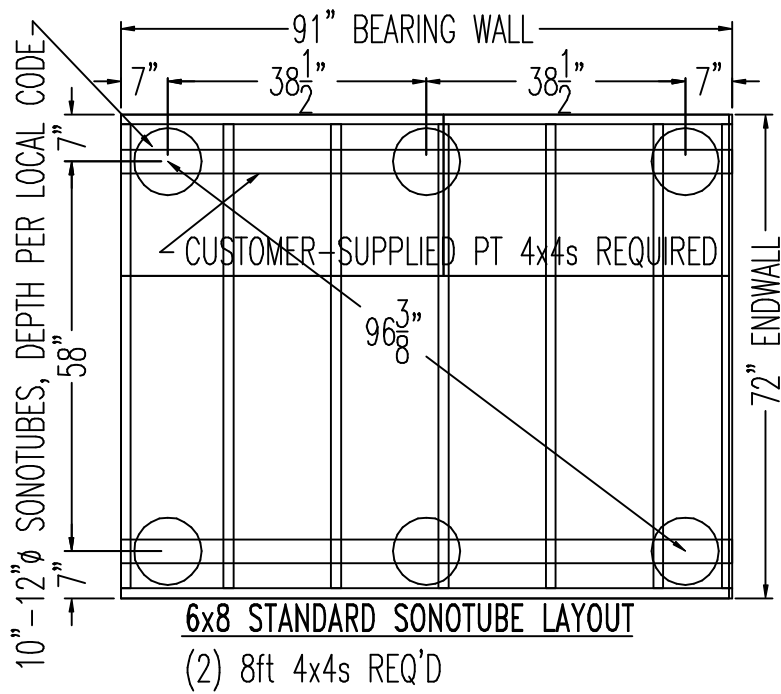
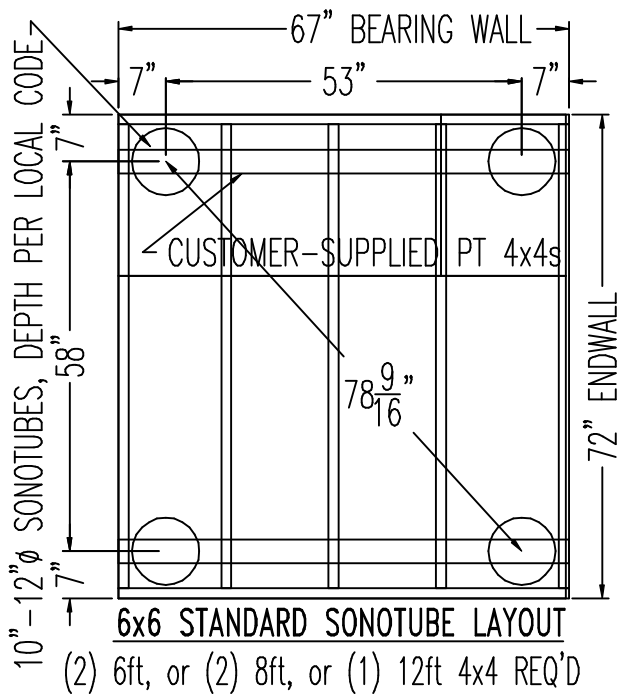


SEE PAGE 5 FOR ALTERNATE DETAIL USING EMBEDDED STRAPS FOR ATTACHMENT (MAY NOT BE ACCEPTABLE IN ALL AREAS)

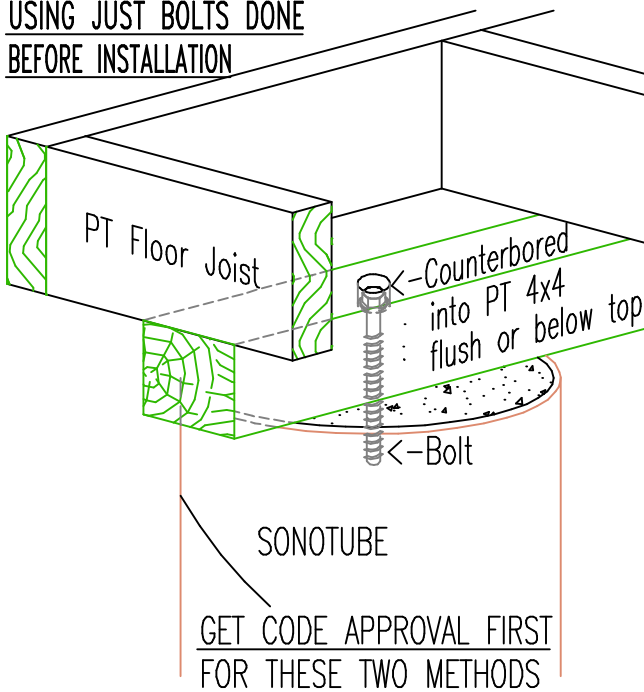
DESCRIPTION	FILENAME	SCALE	REVISION	DESCRIPTION OF CHANGE	SHEDS USA
SONOTUBE-DETAILS-FOR-KITS	SONOTUBE-DETAILS-FOR-KITS.dwg	3/4"=1'-0"	09-08-2010	ADDED TITEN HD AS ALT. ANCHOR BOLT	P.O. BOX 6622 PORTSMOUTH, NH 03802 DRAWN BY: LENNY ANDREWS



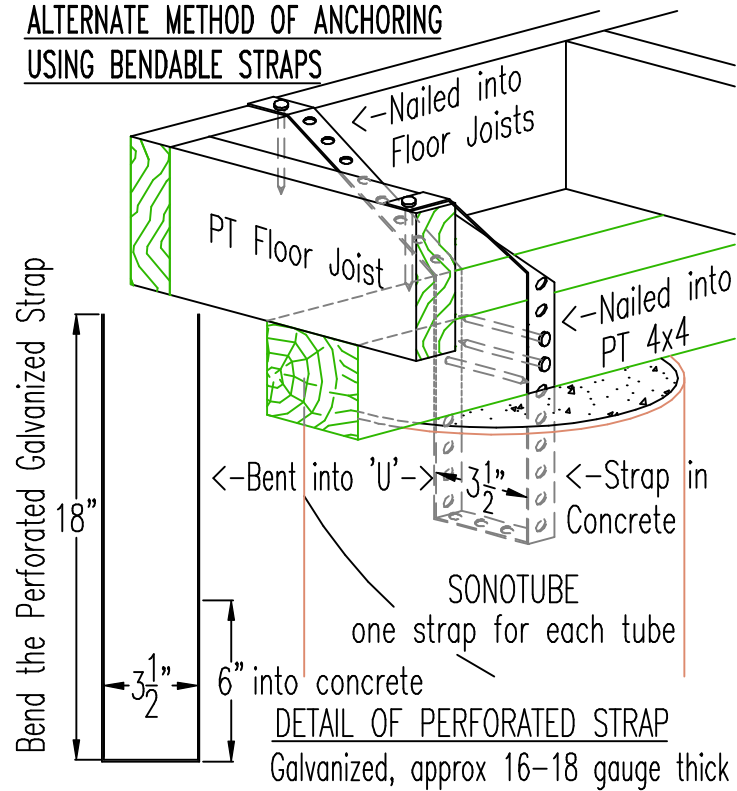
SONOTUBE LOCATIONS FOR GARDEN HUTCHES
 10" TO 12" DIAMETER TUBES REQUIRED, DEPENDING ON SOILS BEARING PROPERTIES. 8" TUBES WILL NOT PROVIDE ENOUGH SUPPORT. LESS THAN 6 TUBES WILL NOT GIVE ENOUGH SUPPORT. DEPTH BELOW GRADE PER LOCAL FROSTLINE. (ASK TOWN) CUSTOMER MUST PROVIDE OR PURCHASE 4x4s, & PROVIDE ATTACHMENT FOR 4x4s PER INSTRUCTIONS.

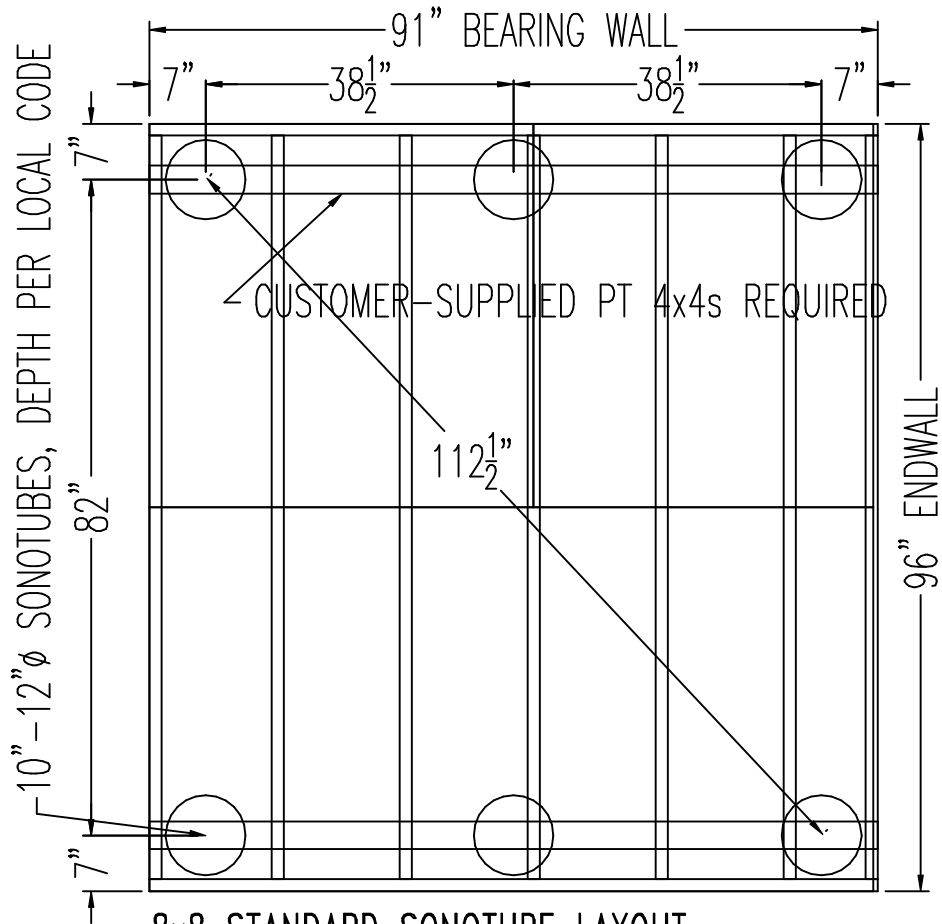


ALTERNATE METHOD OF ANCHORING
USING JUST BOLTS DONE
BEFORE INSTALLATION



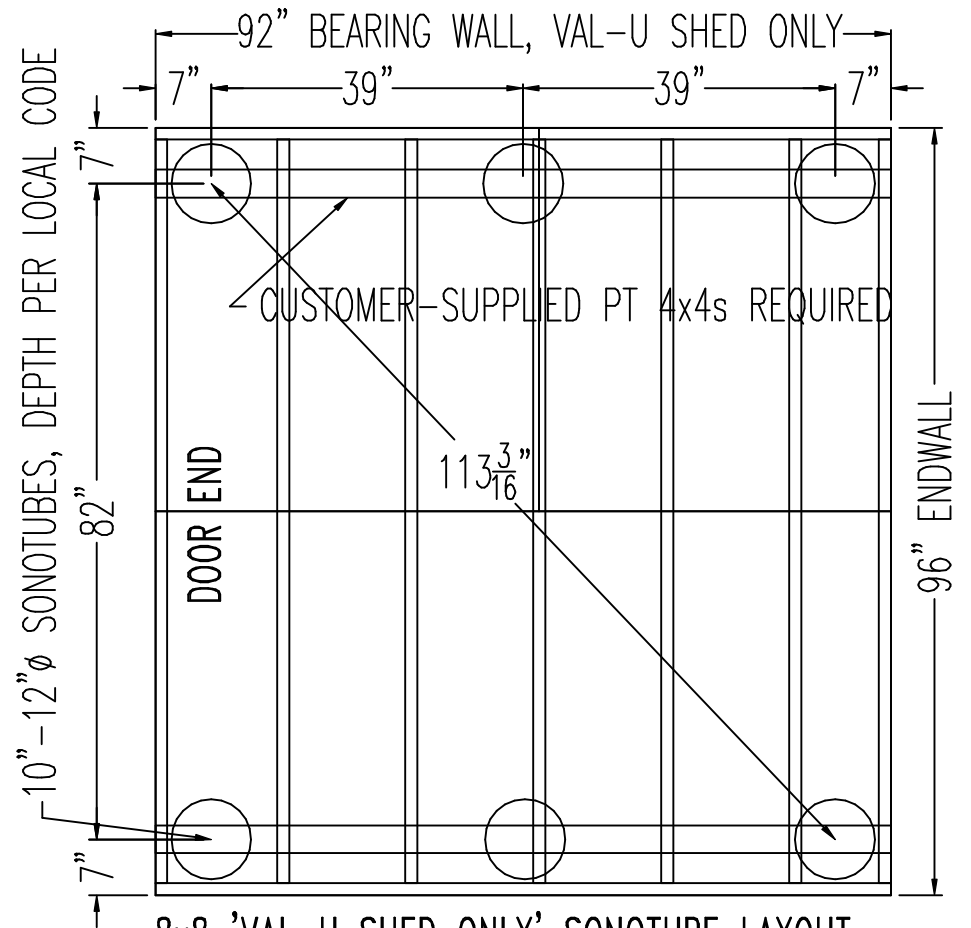
ALTERNATE METHOD OF ANCHORING
USING BENDABLE STRAPS





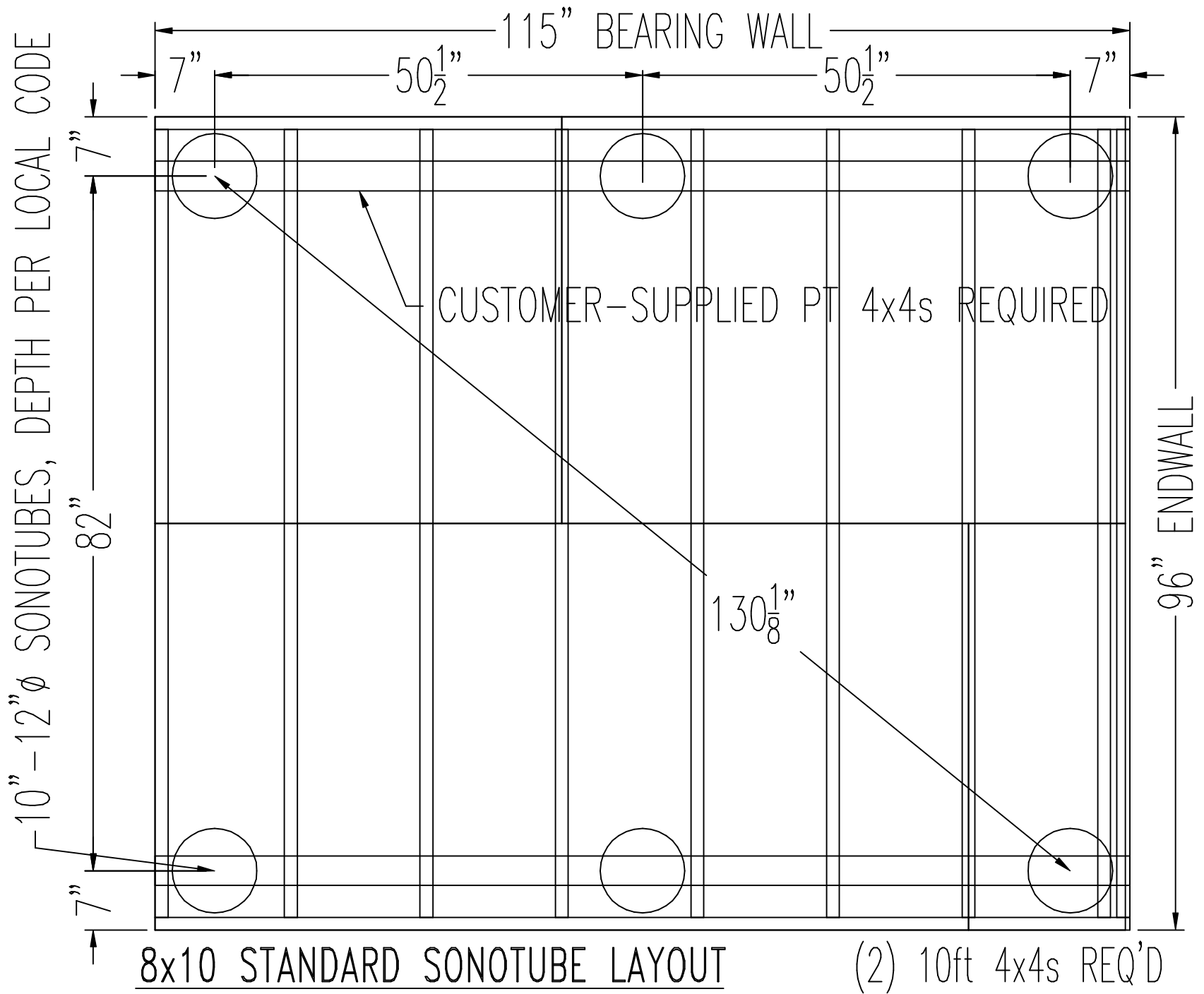
8x8 STANDARD SONOTUBE LAYOUT

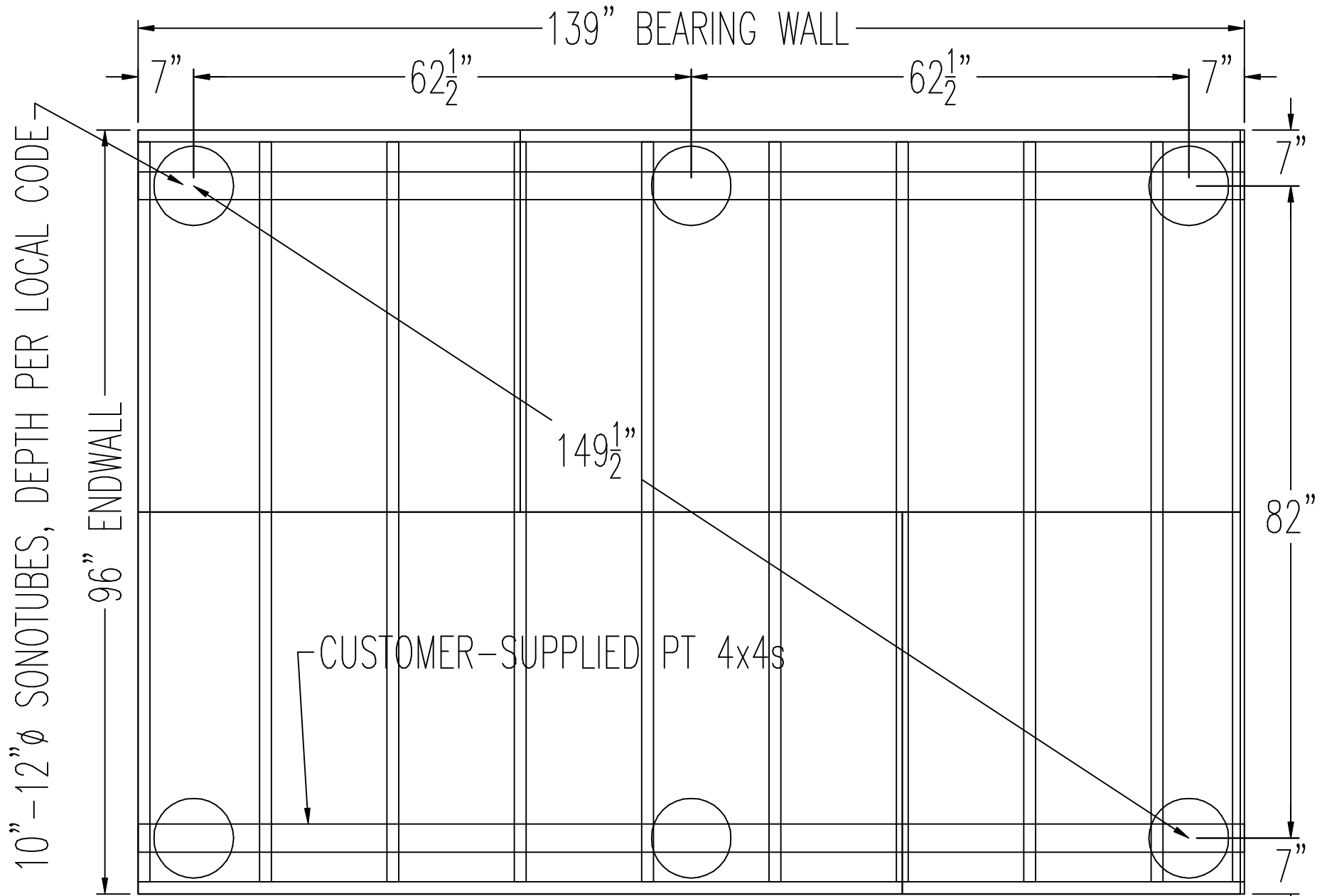
(2) 8ft 4x4s REQ'D



8x8 'VAL-U SHED ONLY' SONOTUBE LAYOUT

(2) 8ft 4x4s REQ'D

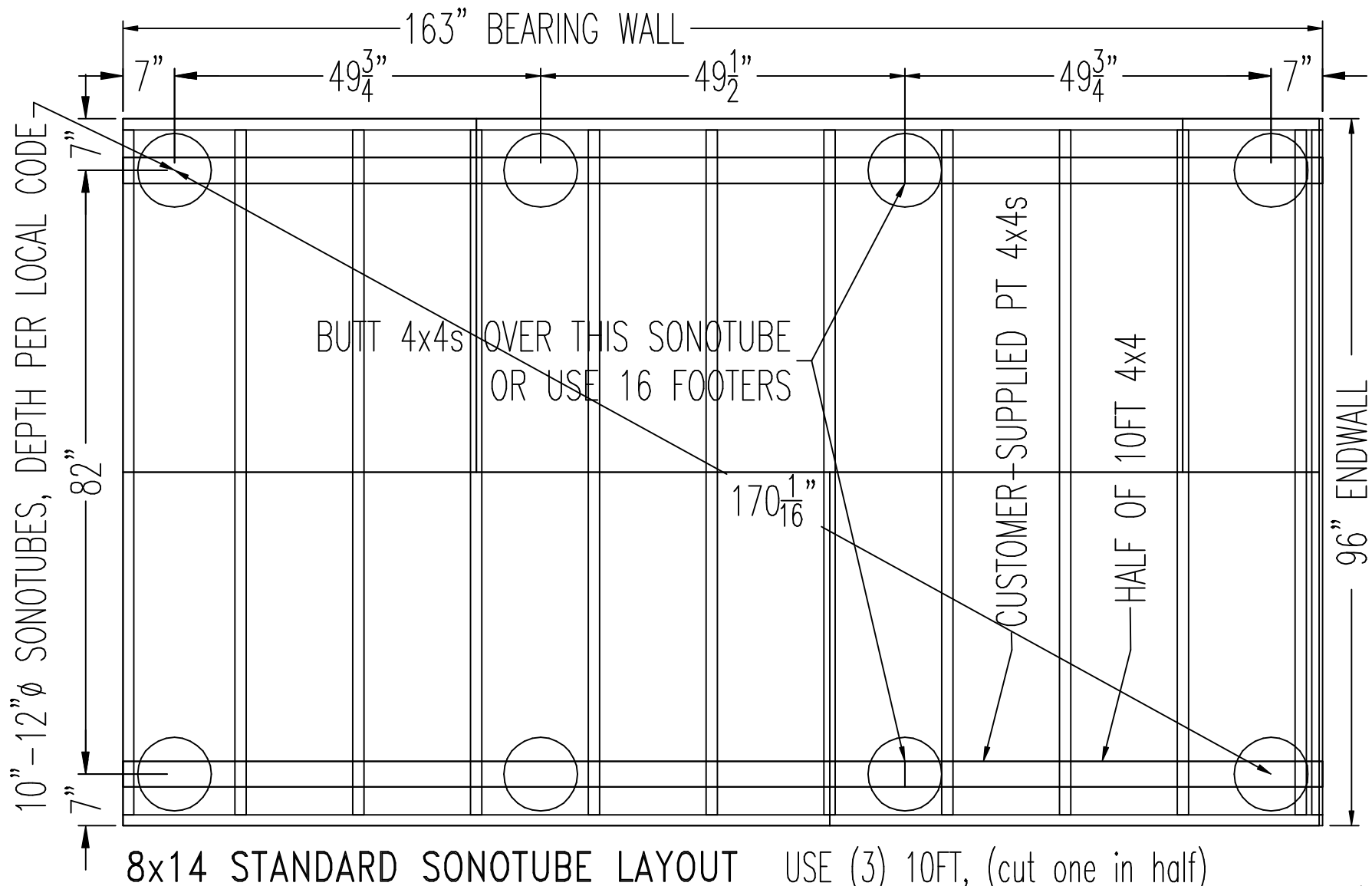




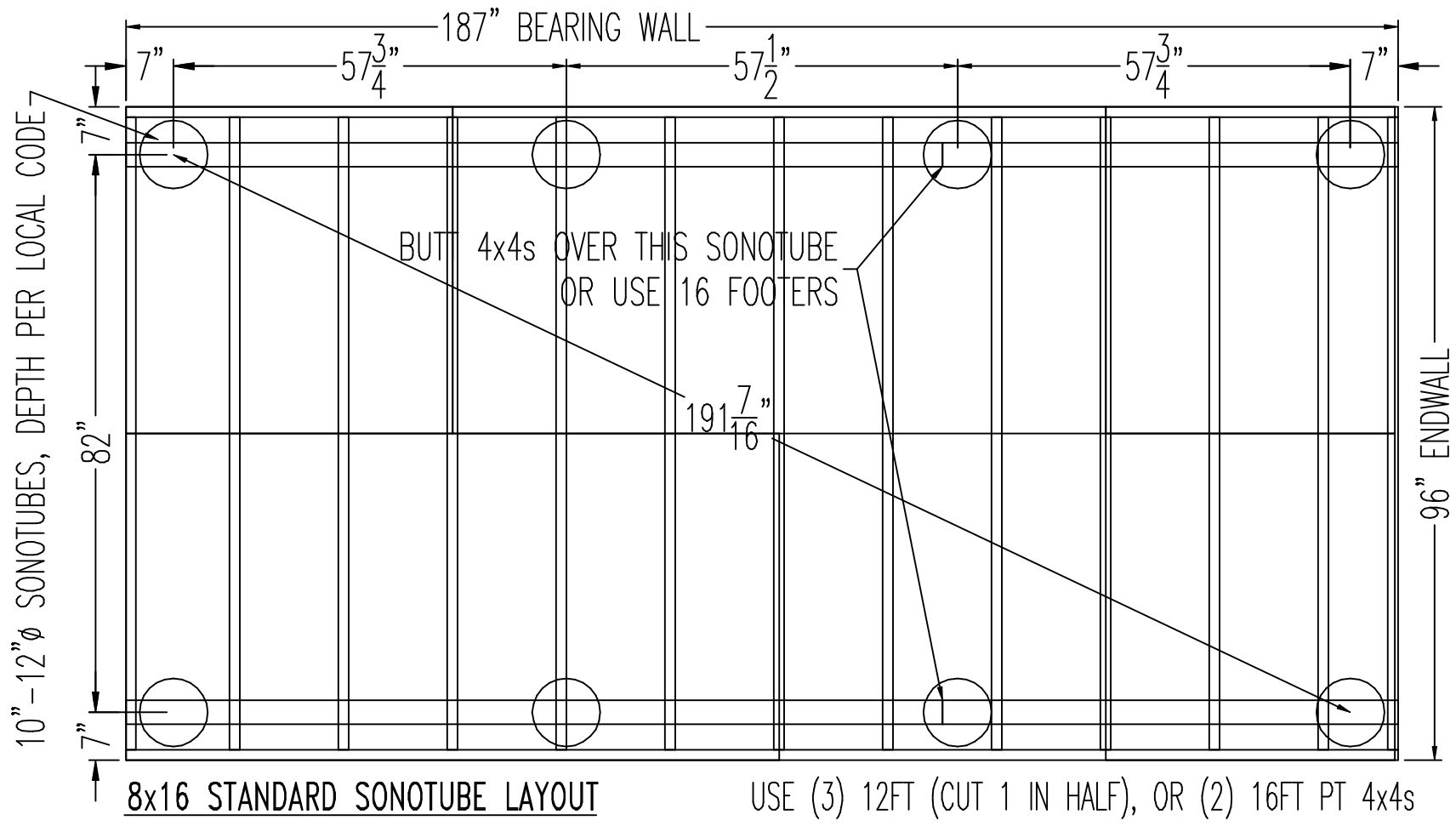
10" - 12" ϕ SONOTUBES, DEPTH PER LOCAL CODE

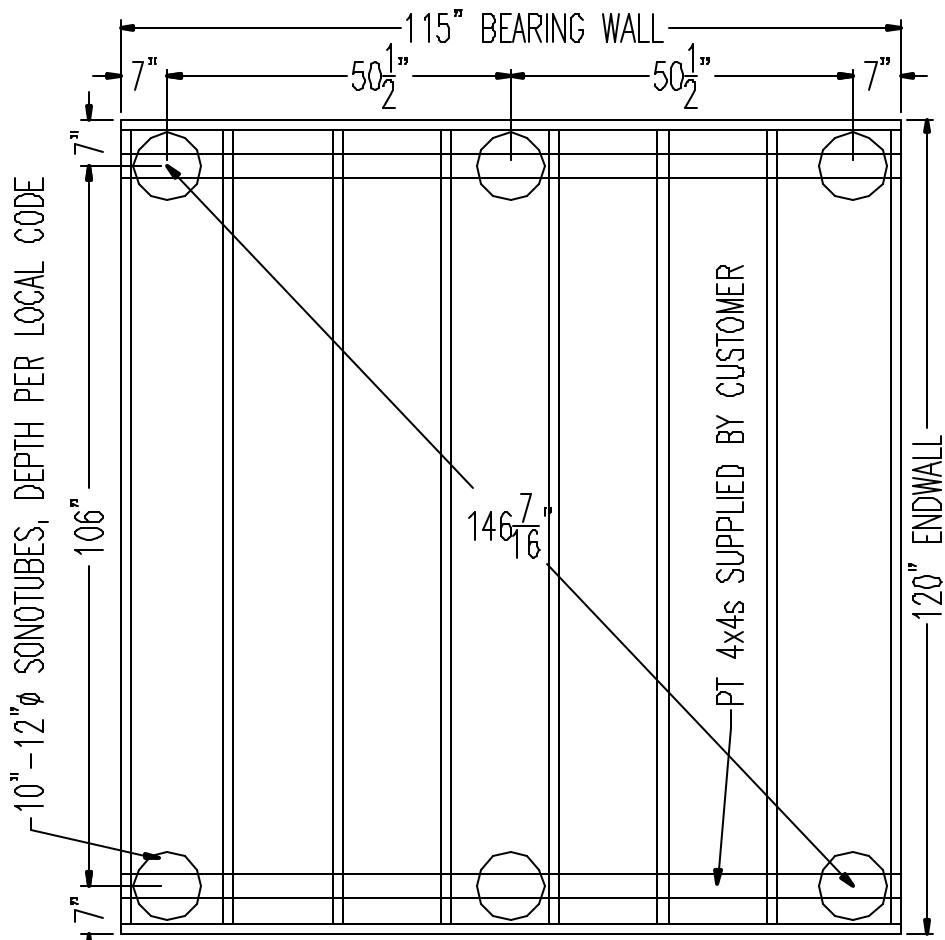
8x12 STANDARD SONOTUBE LAYOUT

(2) 12ft 4x4s REQ'D

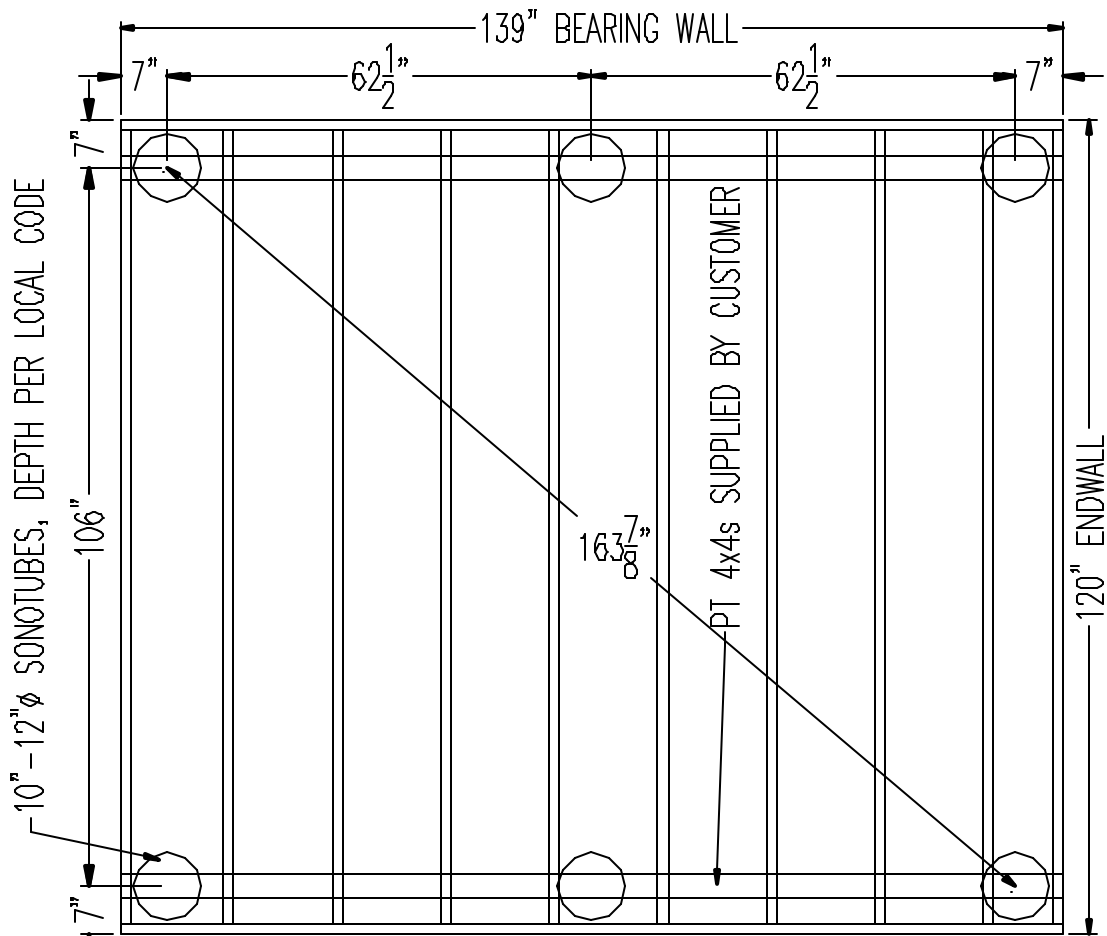


USE (3) 10FT, (cut one in half)
OR (2) 16FT PT 4x4s

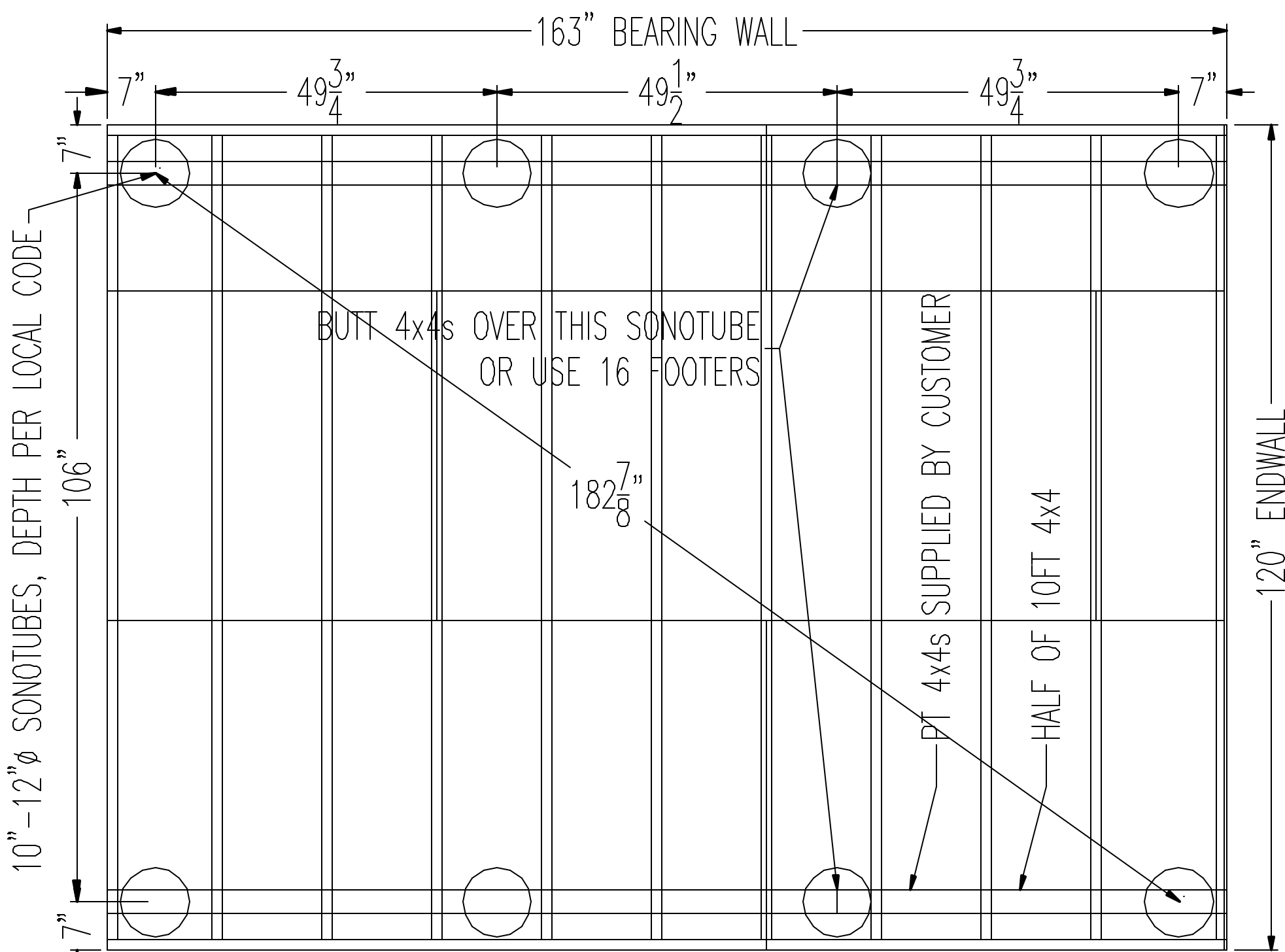




10x10 STANDARD SONOTUBE LAYOUT (2) 10FT OR (2) 12FT PT 4x4s REQ'D



10x12 STANDARD SONOTUBE LAYOUT (2) 12FT PT 4x4s REQ'D



10" - 12" ϕ SONOTUBES, DEPTH PER LOCAL CODE

BUTT 4x4s OVER THIS SONOTUBE
OR USE 16 FOOTERS

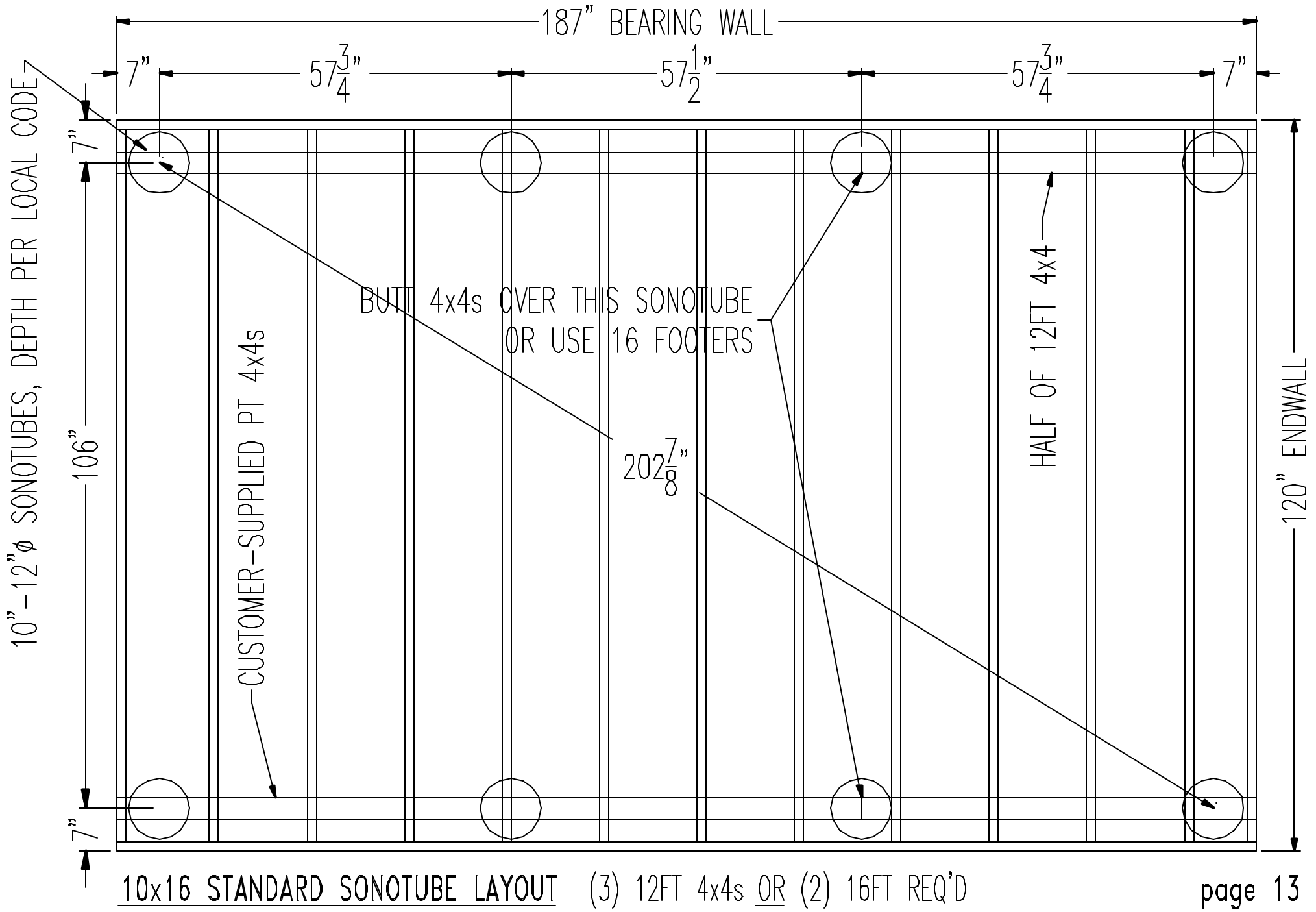
PT 4x4s SUPPLIED BY CUSTOMER

HALF OF 10FT 4x4

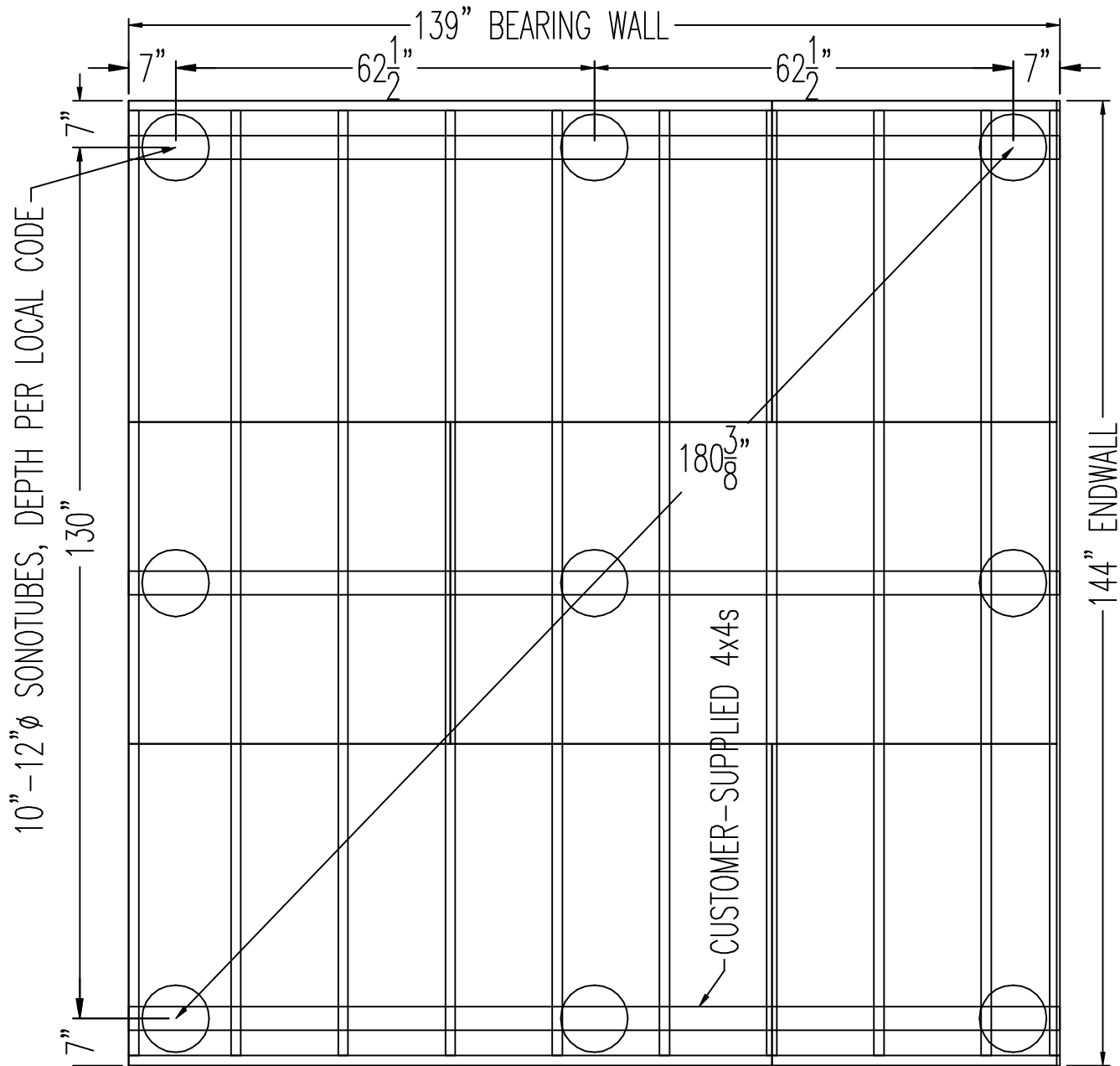
120" ENDWALL

10x14 STANDARD SONOTUBE LAYOUT

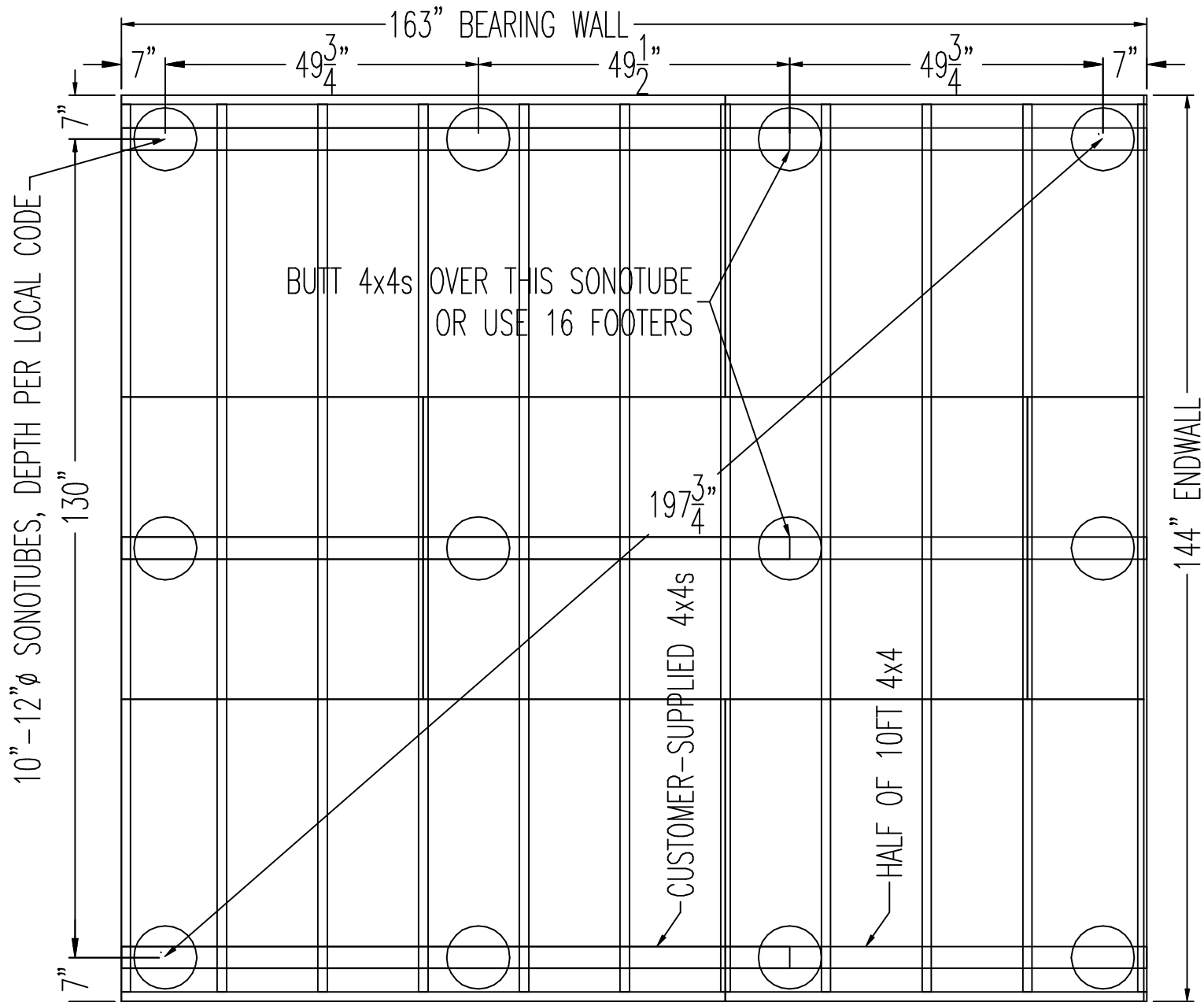
(3) 10FT OR (2) 16FT 4x4s REQ'D



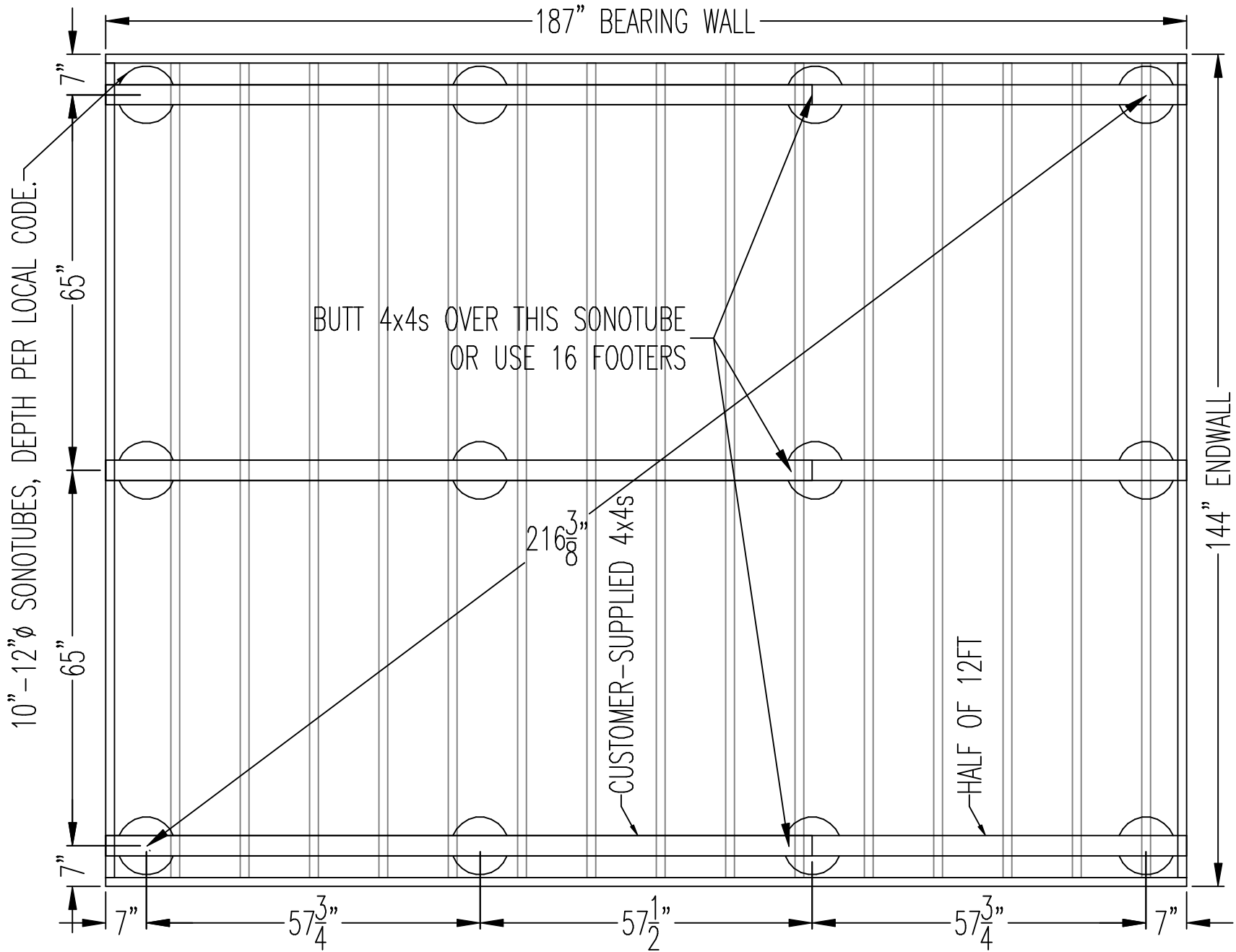
10x16 STANDARD SONOTUBE LAYOUT (3) 12FT 4x4s OR (2) 16FT REQ'D



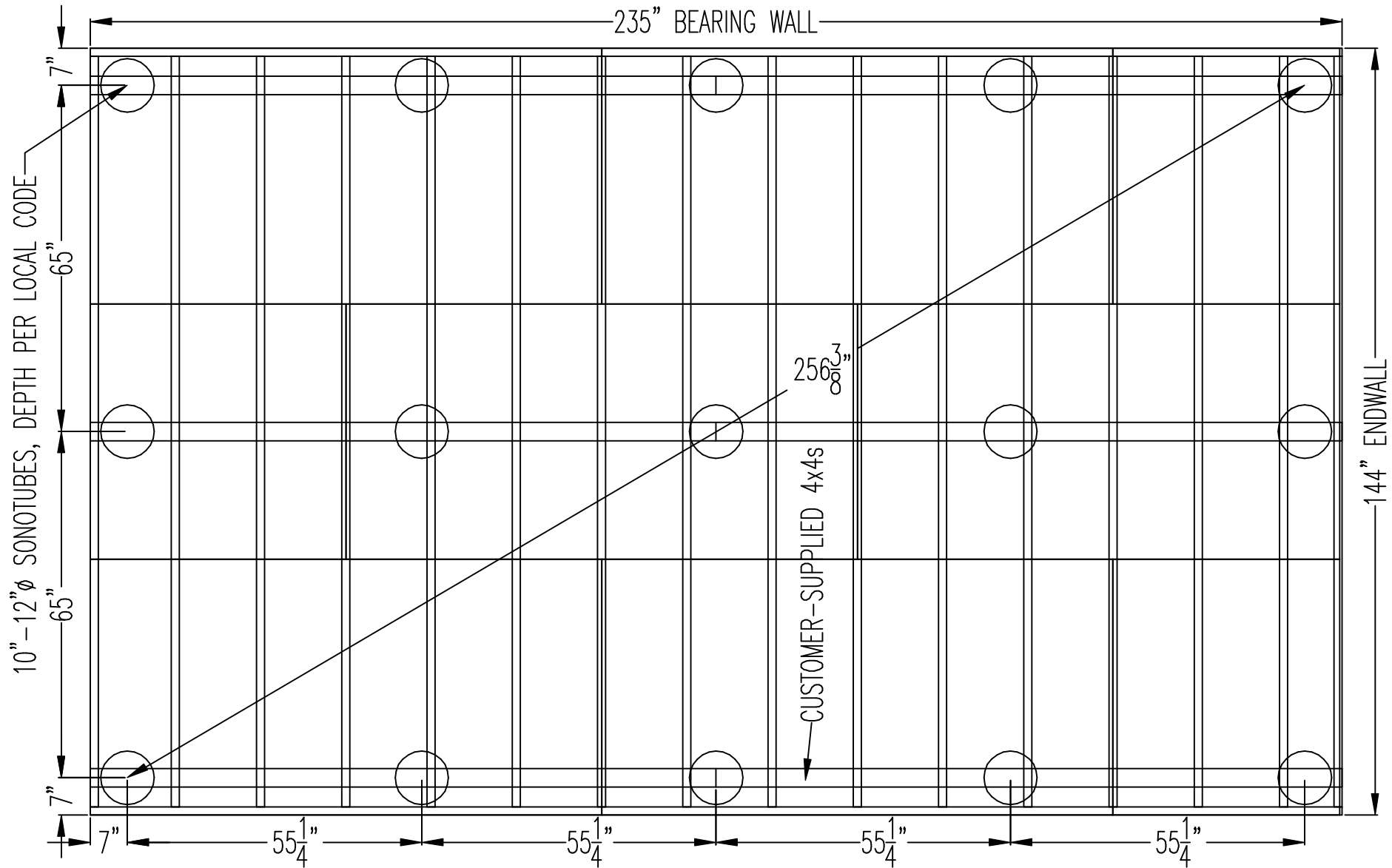
12x12 STANDARD SONOTUBE LAYOUT (2) 12FT 4x4s REQ'D (CENTER 4x4 SUPPLIED W/ SHED) page 14



12x14 STANDARD SONOTUBE LAYOUT (3) 10FT OR (2) 16FT 4x4s REQ'D BY CUSTOMER
 (CENTER 4x4s SUPPLIED W/ SHED)



12x16 STANDARD SONOTUBE LAYOUT (3) 12FT OR (2) 16FT 4x4s REQ'D (CENTER 4x4s SUPPLIED W/ SHED)



(4) 10FT 4x4s REQ'D (CENTER 4x4s SUPPLIED W/ SHED)