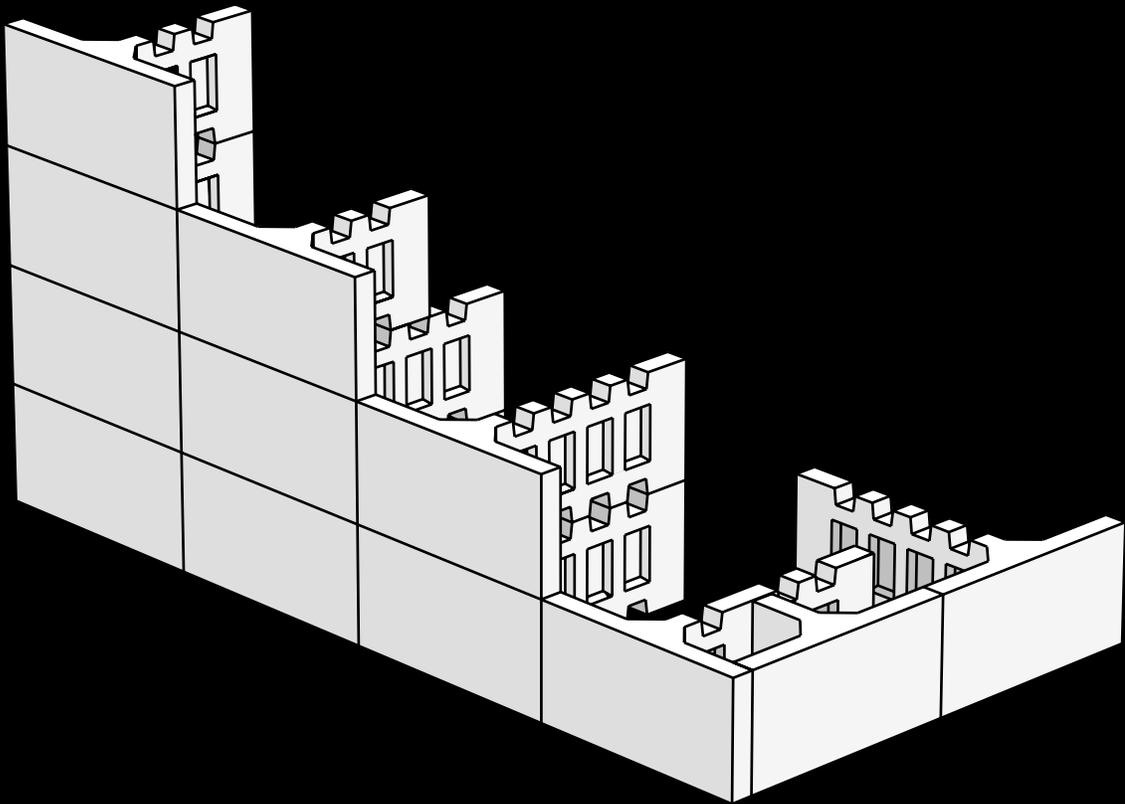


CONSTRUCTION MANUAL

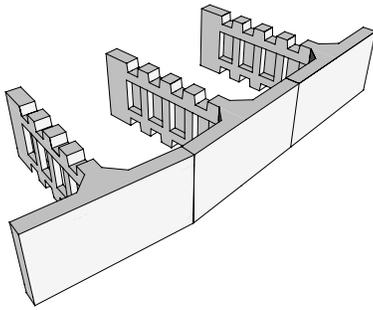
T-WALL®

Retaining Wall System



The T-WALL Solution...

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T-WALL® Retaining Wall System

CONSTRUCTION MANUAL

CONTENTS

Part I	EARTHWORK	1
	• <i>THE STRUCTURE DEPENDS ON IT!</i>	
Part II	INTRODUCTION	2
	•General Overview	2
	•Equipment and Materials Supplied by The Neel Company and/or the Licensed Producer	2
	•Equipment, Materials and Tools Supplied by the Contractor	2
Part III	HANDLING T-WALL UNITS	3
	•T-WALL Unit Delivery	3
	•Unloading the Units	3
Part IV	CONSTRUCTION PROCEDURES	4
	•Site Preparation	4
	•Leveling Pad Construction	4
	•Layout on the Leveling Pad	5
	•Erection of the First Course	6
	•Constructing Subsequent Courses and Backfilling	7
	•Constructing Barriers	8
	•Constructing Corners	9
	•Constructing Large Pipe Penetrations	9

NOTE TO THE READER

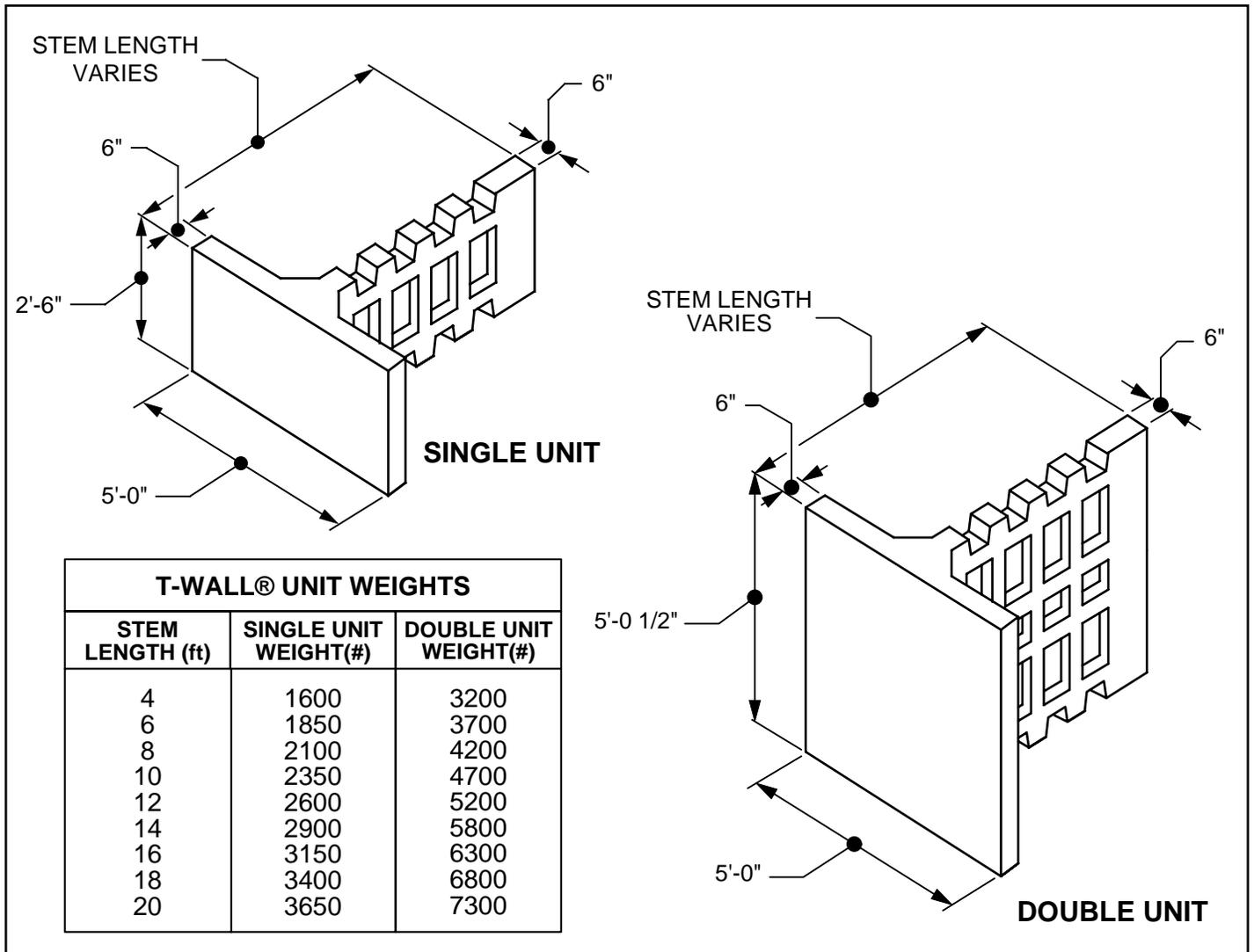
This manual has been prepared as a guide to building T-WALL Retaining Wall structures. Its contents should be thoroughly reviewed by the contractor and the superintendent responsible for construction prior to the delivery of the T-WALL units to the jobsite. The Neel Company and/or its Licensed Producers will provide jobsite technical assistance to help the contractor implement correct construction procedures. Compliance with this manual does not relieve the Contractor of the responsibility to adhere to contract plans and specifications. The T-WALL Retaining Wall System should never be built without drawings stamped by a Professional Engineer.

Part I EARTHWORK – THE STRUCTURE DEPENDS ON IT!

The concrete T-WALL units are only half of the structure; the earth is the other half. This combination makes the wall stand up. The following earthwork items are very important:

- **FOUNDATION** – The foundation should be inspected and approved by the owner’s engineer before the leveling pad is poured. If the foundation is soft, the wall will settle.
- **SELECT BACKFILL GRADATION** – This is critical to the structure’s stability. See the T-WALL shop drawings for project backfill gradation. It is important that gradation tests be performed to ensure that the backfill meets the specifications. The select backfill gradation effects the friction on the stems, drainage and settlement.
- **COMPACTION** – Proper compaction of the backfill between and behind the stems is required to prevent settlement which will effect paving at the top of the wall.

Specifications are printed on the T-WALL shop drawings, failure to meet the specifications of any of the above items will result in wall movement.



Part II INTRODUCTION

GENERAL OVERVIEW:

•WORK TO BE PERFORMED BY THE CONTRACTOR:

- Site preparation, including excavation
- Forming and pouring the leveling pad
- Wall construction including backfilling
- Installation of fences, guardrails or other necessary items

•BASIC CONSTRUCTION PROCEDURES:

- Form and pour leveling pad
- Set first course of units
- Place and compact select backfill
- Place joint material and shear keys
- Set second course of units

•CREW SIZE AND PRODUCTION RATES:

- A typical wall erection crew includes:
 - One operator for lifting equipment
 - One working foreman to check alignment
 - Two men for setting units and placing joint materials
- Construction rates for T-WALL depend entirely upon the rate at which select backfill can be delivered, placed and compacted.

•MATERIALS AND SERVICES SUPPLIED BY THE NEEL COMPANY AND/OR THE LICENSED PRODUCER:

- Sublicense to build the structure
- On-site technical assistance
- Engineering and design of the structure
- Delivery of the following wall materials to the site:
 - Precast concrete T-WALL units
 - Shear keys
 - Horizontal joint material
 - Vertical joint material
 - Shear key wrap material
 - Bolts for corner units

•EQUIPMENT, MATERIALS AND TOOLS SUPPLIED BY CONTRACTOR:

- T-WALL unit lifting equipment: backhoe or small crane.
- Equipment for hauling, dumping and spreading backfill: dump trucks, front-end loaders and dozers.
- Compaction equipment: small walk-behind vibratory roller.
- Tools:

Lifting device	Chalk line
Shims	Level to check grade
Pinch bar	Duct tape (for shear keys and filter cloth)
Four foot level	Power drill (10" x 3/4" carbide bit for drilling bolt holes in corner units)



Unloading units from truck



Lifting a 10' unit at the balance point



Lifting device

T-WALL UNIT DELIVERY:

Prior to the start of construction, the Contractor and the Licensed Producer should develop a schedule for material deliveries. This timetable will allow the producer to match unit production with the construction schedule.

UNLOADING THE UNITS:

Under normal circumstances, a two hour unloading time is allowed for each delivery. During this period of time, the units may be unloaded and stacked on the ground using the lifting device. If the time allows, the units may be placed directly into the wall structure.

Care must be exercised during handling to protect the units and joint materials from damage. Do not stack units more than two high.

Dunnage and plastic edge guards are the property of the Licensed Producer and must be collected and returned as soon as possible.

The Contractor will be loaned one lifting device for the duration of the project. At the conclusion of wall construction, the lifting device will be returned to the Licensed Producer in good working order. If the device is lost, damaged or stolen the Contractor will be responsible for the cost of the device. The replacement cost is \$1,000.

SITE PREPARATION:



Preparing the site



Leveling pad construction



Stepped leveling pad

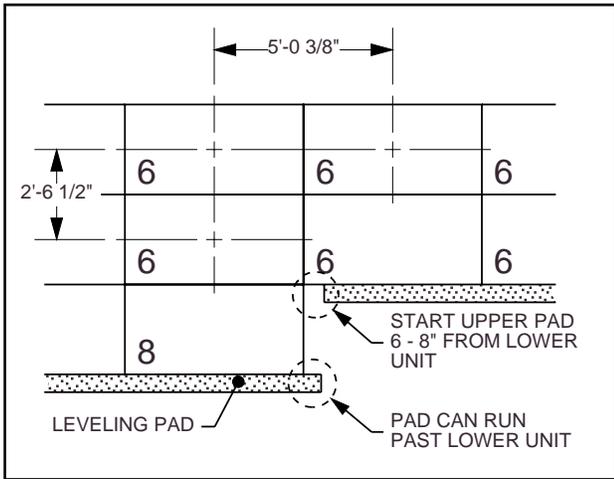
- Excavate the site to the elevation shown on the contract plans for the entire footprint of the T-WALL structure (including the area covered by the select backfill between the stems). Under special conditions, the excavation may be done in increments to minimize the amount of open cut.
- All unsuitable materials below subgrade must be removed and replaced with select, compacted backfill at the direction of the Engineer.
- Compact the subgrade to 95% standard proctor and proof roll the foundation in accordance with the project specifications.
- Excavate for the leveling pad.
- Any underdrains, drainage piping or drainage blankets should be installed at this time.

LEVELING PAD CONSTRUCTION:

The leveling pad is usually 12 inches wide and a minimum of 6 inches deep.

- Form the leveling pad similar to forming a sidewalk. The edge forms are the screed rail. They must be checked with a level to assure proper elevation and tolerance. Finish surface tolerance is 1/4 inch in any 10 foot length.
- Check for alignment. The front edge of the pad should be 3" outside the front face line of the wall.
- The leveling pad is for construction alignment only; the concrete may be low strength, 2,500 psi and there is no rebar in the leveling pad.
- Pour the leveling pad. The concrete surface finish must be smooth and flat. Check the leveling pad for line, grade and tolerance with a level. If the leveling pad is out of tolerance, make corrections at this time.

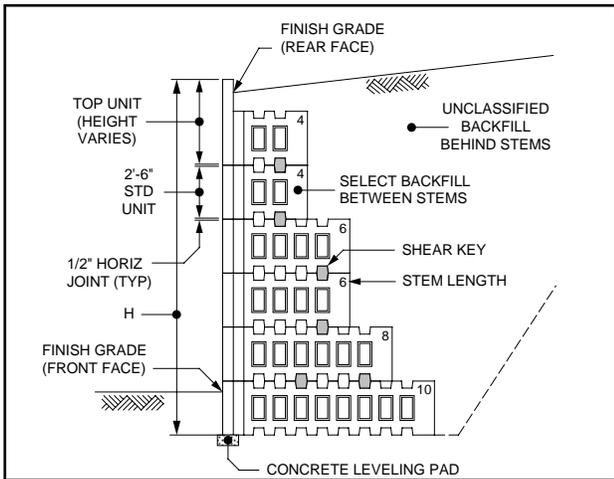
LEVELING PAD CONSTRUCTION (Continued):



Front face of units on stepped leveling pad

•Steps in the Leveling Pad - Construct the lower leveling pad. Leave a 6 to 8" gap before constructing the higher pad. This gap will assure that the higher pad does not interfere with the placement of the units on the lower pad. For a vertical wall, the typical step (change in elevation) is 2'-6 1/2".

•Precast Leveling Pad - In areas where the wall steps up and the leveling pad is only a few units wide, precast leveling pads may be used. Compaction and grading under precast leveling pads is extremely important because any settlement or tilting will result in an unacceptable joint pattern or spalling of the concrete units.



Typical Vertical T-WALL Section

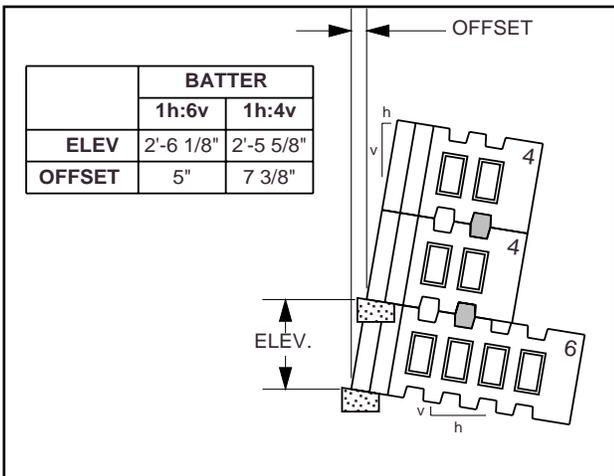
LAYOUT ON THE LEVELING PAD:

•To establish wall alignment, snap a chalk line on the surface of the leveling pad about 3" back from the front of the pad. This will be the front face of the wall and will center the unit on the leveling pad.

•Begin at 2'-6" from the start of the wall and mark the leveling pad at 5'-0 3/8" increments. The T-WALL unit is 5' long with a vertical joint opening of 3/8". These marks indicate the center of the unit and where the stems of the units will rest on the subgrade.

•Grade the subgrade material at these marks level with the pad to the full depth of the stems so that the front face of the units will be plumb. After a unit is set, it is much easier to shim the stem up than to excavate down; therefore it is better to be low than high in this operation.

•For a battered wall, the pad and the material behind it should be graded on the appropriate slope as shown on the project drawings (usually 6 horizontal to 1 vertical or 4 horizontal to 1 vertical).



Battered T-WALL Section - Stepped leveling pad



First course of units on leveling pad



Second course / joint material



Putting units into position

ERECTION OF THE FIRST COURSE:

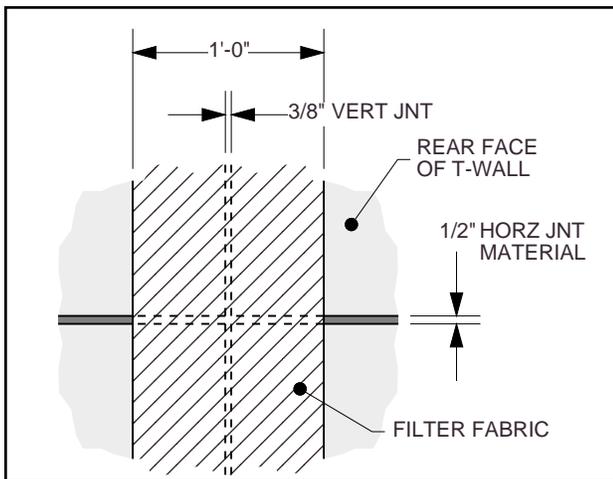
- Always begin erection at a fixed point such as a corner, step, or tie-in to an existing structure. If there is no fixed point, simply start on the lowest leveling pad.
- Joint material is not required between the leveling pad and the precast units.
- Set the first units on the leveling pad, using the chalkline and marks as a guide for centering the stems and aligning the front face.
- Adjust the elevation of the back of the stem to plumb the front face of the unit.
- After alignment, check the top of the front face for level and height with relation to the other units in this course. If the top of the unit is irregular, place the level on the line where the top of the front face is chamfered. Shim as necessary. Rechecking alignment, level and plumb to make sure that you have not disturbed one while adjusting the other.
- Finally, step back and sight down the tops of the units. This visual check will allow you to fine tune the alignment.
- Every effort should be made to ensure that the first course of units is properly aligned and level.
- Construct the wall in horizontal lifts.

WALLS HAVE A TENDENCY TO GROW OR SHRINK IN LENGTH DEPENDING ON THE AMOUNT OF CARE TAKEN TO PROPERLY LAYOUT AND ALIGN THE FIRST COURSE!

CONSTRUCTING SUBSEQUENT COURSES AND BACKFILLING:



Filter fabric covering vertical joints on back face



Filter fabric placement



Shear keys wrapped in joint material

- Prior to initial backfilling, the 12" wide filter fabric should be cut into lengths equal to the height of the wall at each vertical joint. Center these strips across the 3/8" vertical joints between the units at the rear face. This procedure prevents the migration of the backfill material through the joint.
- Throw the excess filter fabric over the top of the units during backfilling and pull it back on the backfill during setting operations.
- Horizontal joint material is placed in the horizontal joints between the units at the front face. This material acts as a cushion to prevent concrete-to-concrete contact and as a gasket to prevent backfill material leakage. Position the horizontal joint material so that it is flush with the rear face of the unit.
- Shear keys, wrapped with 1/4" joint material, should be placed in the space between teeth where the top and bottom stems come together.
- The number of keys required per unit should be shown on the project drawings. Typically, one key is used per 6 feet of length or fraction thereof. Shear keys should be spaced equally beginning at the rear most opening in the shorter unit.
- The purpose of the shear keys is to:
 - provide an alignment guide
 - prevent movement of the unit during backfill and compaction
 - provide additional pullout resistance at the top of the wall.
- It may be necessary to plumb the units using shims on top of the shear keys.
- On battered walls it will be necessary to snug the shear keys to prevent the units from sliding downhill during compaction.

CONSTRUCTING SUBSEQUENT COURSES AND BACKFILLING (Continued):



Placing the backfill



Compacting the backfill

- If you encounter a unit that is out of square it is best to use the stem as a guide to alignment. Keep in mind that this is purely an aesthetic concern, not a structural problem.

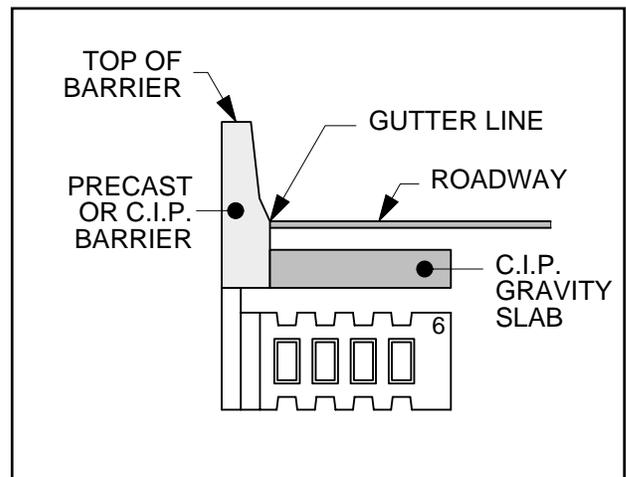
- Dump the select granular backfill material directly on top of the stems. This procedure will fill both sides equally and prevent lateral movement of the unit.

- Do not stack the units more than one unit high without backfilling. It is unlikely that the subgrade will support the point load of the stem and the front face of the wall will be out of plumb by the time the backfill is placed.

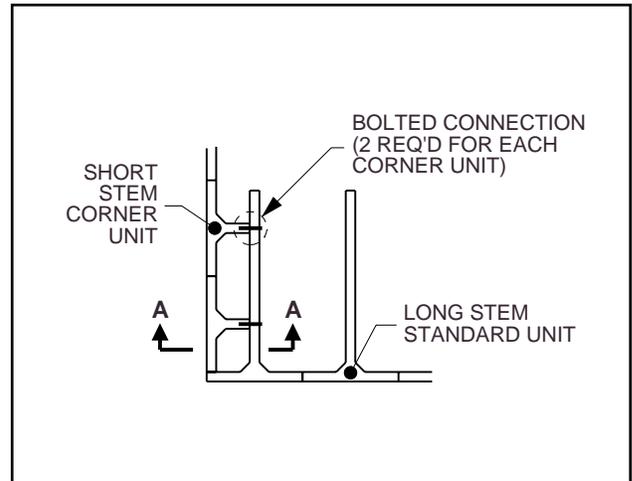
- Backfill and compact each course of units completely before starting the next course. The loose lifts of backfill should not exceed 12 inches before compaction. Each lift must be thoroughly compacted before more fill is placed. Failure to adequately compact the backfill can jeopardize the stability of the wall.

- Backfill and compact the fill in front of the wall as soon as possible. This procedure must be accomplished before the wall is 10 feet high.

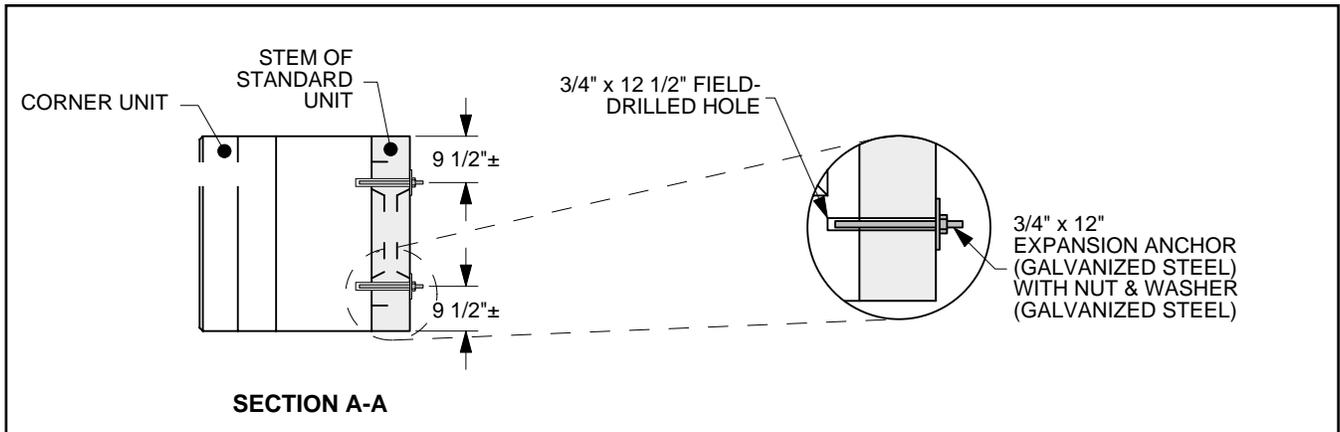
CONSTRUCTING BARRIERS:



CONSTRUCTING CORNERS:



Stem arrangement at corner



Detail of bolt connection at corner

CONSTRUCTING LARGE PIPE PENETRATIONS:

