| Department of Design and Construction | SPECIFICATION BULLETIN | SB 24-002 |
|---|---|---|

Title: **SHEETING AND BRACING**

| Prepared: | Approved: |
|---|---|
| Digitally signed by Mohammad Mahmud Date: 2024.03.29 10:46:17 -04'00' 4/1/2024 | How Sheen Pau, P.E. Digitally signed by How Sheen Pau, P.E. Date: 2024.03.29 10:59:46 -04'00' 4/1/2024 |
| Mohammad Mahmud, P.E. Date<br>Director, Specifications | How Sheen Pau, P.E. Date<br>Associate Commissioner – Infrastructure Design |

## APPLICABILITY:

- This Specification Bulletin (SB) is effective for projects advertised on or after 4/15/2024.

## SUPERSEDENCE:

- This SB supersedes the following SBs: **None.**

## ATTACHMENTS:

1. *Section 40.05 (7 page)*

## REVISIONS TO THE NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION STANDARD SEWER AND WATER SPECIFICATIONS, DATED 8/8/2022:

All references contained below are to the New York City Department of Environmental Protection Standard Sewer and Water Specifications, Dated August 8, 2022. Said Standard Specifications are hereby revised as follows:

a) **Refer** to Section 40.05-SHEETING AND BRACING

**Delete** in its entirety Section;

**Substitute** the revised Section in Attachment 1 (7 pages)

For questions regarding this bulletin, please contact Richard Jones, jonesri@ddc.nyc.gov.

## SECTION 40.05 – SHEETING AND BRACING

### 40.05.1 SHEETING AND BRACING

(A) The sides of the trenches and excavations must be supported by adequate close sheeting and properly braced. All sheeting and bracing systems the Contractor elects to use or are ordered by the Engineer or the Department must comply with these specifications and must receive the approvals stated herein. Timber sheeting and bracing must be vertical sheeting with a minimum of two (2) levels of wales and braces or horizontal sheeting supported by vertical steel soldier beams and the necessary bracing.

(B) Where the material to be excavated is of such character as to render it necessary, the sheeting must be tongued and grooved and driven to such depths below the subgrade as may be directed.

(C) Where the nature of the material encountered or the safety of the adjacent structure render it necessary, the Contractor may resort to the use of steel sheet piling with prestressed bracing or the Contractor may underpin the structure or buildings.

(D) Other sheeting systems may be permitted upon approval of the Department of Design and Construction. Horizontal hydraulic waler systems used with steel plates or plywood (also called speed shores) will not be permitted. Trench Boxes will not be permitted for use in trenches and excavations that exceed twelve (12) feet in depth. (See **Subsection 40.05.4(E)**.)

(E) In general, sheeting and bracing in trenches and excavations must be designed and installed so that the sheeting must not be braced or blocked against any part of the new structure, or manholes, or chambers. When conditions warrant, bracing against such structures may be permitted following the approval of drawings prepared and submitted by a Professional Engineer licensed in the State of New York, showing the assumed design loads and stresses, and details of such bracing.

(F) If, in the opinion of the Engineer, any of the approved temporary or permanent supporting structures are inadequate or unsuitable for the actual conditions in the field, the Engineer may direct the Contractor to strengthen the supporting structures at no additional cost to the City. The Contractor is responsible for the sufficiency of all temporary and permanent supporting structures whether or not directed by the Engineer to strengthen them.

(G) Unless otherwise specified in the plans or these specifications, the Contractor must remove all sheeting and bracing throughout this project as per **Subsection 40.05.7**.

### 40.05.2 SHEETING LEFT IN PLACE

When sheeting is specifically shown on the plans or specifically described in the specifications or specifically ordered in writing by the Engineer to be left in place, it refers to all sheeting and bracing in trench excavations for water main pipe and sewer conduit, including manholes, valves, and chambers. Excavations for catch basins, basin connections, house services, and other excavations not considered part of the trench excavation for water main pipe and sewer conduit must have their sheeting and bracing removed entirely.

When sheeting is to be left in place, all elements, such as wales and braces, of the sheeting used, must be left in place, except for such temporary braces that require removal in order to make way for the structure. Where it is necessary to remove such temporary braces, the sheeting must be rebraced in a manner approved by the Engineer; however, in no case may the sheeting be braced against the side of the structure unless approved in writing by the Engineer. Where lagging and soldier beams are used, the soldier beams and all the wales and braces must also be left in place. Where steel sheeting is used, the wales and braces must also be left in place.

When sheeting is to be left in place, the Contractor must cut sheeting at the elevations ordered in writing by the Engineer; however, in general such cutoffs must not be less than four (4) feet below the final grade. Timber sheeting must be cut off by sawing. Steel sheeting or soldier beams must be cut off by burning. Breaking off of sheeting will not be permitted. The Contractor must remove from the trench and away from the site of work to the Contractor's own place of disposal, all cut sheeting and soldier beams together with all wales, lagging, and braces above the ordered elevation of cut. Where the removal of wales and braces above the ordered elevation of cut is determined by the Engineer to render the sheeting system unstable,

wales and braces must be placed prior to cutting at a level below the ordered elevation of cut and left in place.

(A) FOR SHEETING OF WATER MAIN TRENCHES AND EXCAVATIONS

Additional payment will be made for sheeting and bracing that is specifically shown on the plans or specifically described in the specifications or ordered in writing by the Engineer, to be left in place in water main trenches and excavations. Payment will be made in accordance with **Section 70.91**.

(B) FOR SHEETING OF SEWER TRENCHES AND EXCAVATIONS

No separate or additional payment will be made for sheeting and bracing that is specifically shown on the plans or specifically described in the specifications to be left in place in sewer trenches and excavations, regardless of the type used nor for the removal from the trench and excavation and the disposal away from the job site of the cut sheeting, bracing, and wales. The cost thereof must be included in the prices bid for all sewer contract items of work, except when separate payment for sheeting and bracing is provided, in this case the cost must be included therein. When sheeting is specifically ordered by the Engineer, to be left in place in sewer trenches and excavations, the cost for all labor, materials, cutting, removal, disposal, insurance, and work required to leave sheeting in place must be determined in accordance with **Articles 25 and 26** of the Contract.

### 40.05.3 MATERIALS

(A) Timber sheeting and bracing must be of new or acceptable used timber free from injurious defects. Timber and lumber for bracing, shoring, fencing, bridging, and decking must conform to the requirements of **Section 23.06**.

(B) Steel soldier beams must comply with the requirements of **Section 23.05**, except that approved used material will be permitted. Steel sheet piling must comply with the requirements of **Section 24.01**, except that approved used materials will be permitted. Steel used for sheeting systems or for any other purposes herein must meet or exceed the requirements of ASTM A36.

(C) Steel Plates for use as sheeting will be permitted provided that they are properly installed and continually supported by wales or beams. The use of rigid steel bracing frames which partially support the steel plates will be permitted up to a depth of twelve (12) feet, provided the steel plates are installed close without gaps, or that the gaps are sealed to the satisfaction of the Engineer. The use of steel plates in conjunction with trench boxes will not be permitted (trench boxes cannot be considered as steel bracing frames). The use of timber bracing frames with vertical steel plates are not allowed.

(D) Steel Sheeting must conform to the requirements of **Section 24.01** and must be installed with continuous interlock.

### 40.05.4 CONSTRUCTION METHODS

(A) GENERAL - Timber sheeting and bracing and other sheeting systems must be of sufficient dimensions and strength, and steel sheeting must be of sufficient type, size, and weight, to support adequately the sides of the trenches and excavations and ensure the safety of adjacent structures and must be installed in accordance with the approved sheeting details. The Contractor must be solely responsible for the adequacy and sufficiency of all sheeting and bracing used.

(B) SHEETING - Unless otherwise specified, timber sheeting and bracing must be driven or placed ahead of the excavation in such a manner as to prevent the loss or slippage of ground in order to safeguard adjacent surface and subsurface structures. The sheeting (except horizontal lagging systems and trench box systems) must be driven to adequate depth below subgrade. As the work progresses, any voids back of the sheeting must be filled and compacted in accordance with **Section 40.06** and as directed by the Engineer.

(C) Sheeting can be used as forms for concrete work. Whenever sheeting is used as formwork as specified or approved by the Engineer only timber sheeting will be permitted unless otherwise approved or specified in writing by the Engineer. When sheeting is used as formwork, an approved protection must be placed between the sheeting, bracing, or soldier beams, and the concrete. In addition, when sheeting is used as formwork for any structure or portion thereof, the thickness of that structure or portion of such structure

must be increased by three (3) inches beyond the original neat line of such structure or portion thereof. The sheeting, soldier beams, or other bracing cannot encroach upon the original neat line of the structure. In such instances when sheeting, soldier beams or other bracing is found to encroach upon the neat line of the structure, the Engineer must direct the Contractor to remove such sheeting, soldier beams, or other braces, and redrive and/or replace the sheeting, soldier beams, or other braces outside the neat line of the structure. All sheeting used as formwork must be removed.

(D) All open cuts must be excavated with vertical sides and properly supported with close sheeting and bracing in conformity with the requirements of **Section 40.03 - Earth Excavation**, 12 NYCRR Part 23 – "Protection in Construction, Demolition and Excavation Operations", and 16 NYCRR Part 753 – "Protection of Underground Facilities".

(E) The Contractor is advised that trench boxes will be permitted for use as a sheeting system provided that the depth of trench does not exceed twelve (12) feet. The use of trench boxes to partially sheet trenches that are greater than twelve (12) feet in depth will be strictly prohibited.

Should trench boxes meeting the above requirements be utilized, the trench will not have to be sheeted completely to subgrade. The trench box will be permitted to "hang up" to a maximum of two (2) feet above subgrade provided that the existing ground water table is not higher than the subgrade and the existing soil in the area of the subgrade can "stand up" on its own without sheeting. It is explicitly noted that use of a "hang up" trench box does not relieve the Contractor from dewatering requirements. Should running ground be encountered or should the soil in the subgrade area begin to slough off, the Contractor will be required to extend the trench box to subgrade. The Engineer must always maintain the right to order the Contractor to lower the trench box to subgrade as required.

No deductions will be made from any payment for not sheeting the bottom two (2) feet of trench if approved by the Engineer and no additional payment will be made should the Contractor be directed to sheet completely to subgrade.

All sheeting and bracing drawings (including hang up trench boxes) submitted for approval which indicate trench boxes must be designed for the full depth of trench (to subgrade) and must show the trench box installed from the ground surface to subgrade. This requirement is to ensure that a hang up trench box has the ability to be installed to subgrade should the site conditions warrant, or as directed by the Engineer.

(F) SLOPED SIDES OF TRENCHES OR EXCAVATIONS - Where the Contractor requests permission not to sheet a trench or excavation, and the Contractor offers to slope the sides of such trench or excavation in accordance with OSHA Regulations in lieu of such sheeting, the Contractor's request must be reviewed by the Engineer.

If the Engineer deems such sloping to be acceptable, the Engineer must so notify the Contractor in writing.

Pavement excavation and restoration requirements must be governed by the width of the trench measured at the bottom of the pavement foundation. Pavement excavation and restoration in excess of those required in connection with standard trench excavation, as specified, must not be paid for.

In those cases where the Contractor does not request permission to side slope, but the Engineer determines that side sloping is in the best interests of the City, the Engineer must order the Contractor to proceed using such side sloping. In these cases, the additional pavement excavation and restoration will be paid for at the appropriate bid unit price.

In both of the above cases, it must be presumed that side sloping a trench or excavation is done to obtain a lower cost for the work to be performed. The City must, therefore, take an <u>appropriate</u> credit to cover the difference in overall costs resulting from the use of side sloping instead of timber sheeting.

(G) SHEETING METHODS

The following methods of sheeting trenches are acceptable:

(a) Vertical wood sheeting with a minimum of two layers of wales and braces

(b) Steel soldier beams with horizontal wood lagging

(c) Interlocking steel sheeting

(d) Trench boxes, for trench depths up to twelve (12) feet

(e) Steel soldier beams with steel plates continually supported

(f) Steel frames with steel plates, for trench depths up to twelve (12) feet

(g) Slide rail type sheeting frames and plates

**40.05.5 SHOP DRAWINGS**

The Contractor will be required to submit Shop Drawings detailing the sheeting system whenever the depth of cut exceeds five (5) feet. Where decking is required, the Contractor must submit the sheeting system shop drawings and the decking shop drawings at the same time for approval.

(A) Before commencing any excavating operation, the Contractor must have approved drawings from the Department of Design and Construction for all types of sheeting and bracing systems, cofferdams, shoring, underpinning, bridging, decking, and all other temporary or permanent supporting structures required.

(B) The Contractor must submit for approval five (5) copies of sheeting and bracing drawings, and other structures (i.e., decking, bridging) drawings that the Contractor proposes to use for the work.

(C) The Contractor must have these drawings prepared by a Licensed Professional Engineer, currently registered in the State of New York. Such drawings must be submitted together with design calculations, references, tables, and charts. Both drawings and design calculations must bear the imprint of the Licensed Professional Engineer’s seal and signature.

(D) In designing the sheeting stated above, the Contractor's Engineer must take note of the standard minimum load diagram requirements for Watertight and Non-Watertight sheeting structures. (See Sewer Design Standards.)

(E) The following notes must be required on all sheeting detail submissions:

(1) If the actual surcharge is in excess of three hundred thirty (330) pounds per square foot, the Contractor must adequately reinforce the sheeting and bracing as required at no additional cost to the City.

(2) Maximum pilot cut must be five (5) feet.

The sheeting and bracing drawings must also include but not be limited to the following: the density of the soil, the internal angle of friction of the soil, the stress grade and type of member, the allowable stresses, and the sequence of construction operation where required.

(F) Shop drawings of sheeting, bracing, and other structures used by the Contractor must be signed by and carry the seal of a Professional Engineer licensed in the State of New York. These drawings must be submitted together with proper design computations bearing the same seal and signature. Shop drawings must be on sheets twenty-eight (28) inches by forty (40) inches with a one-half (1/2) inch marginal space on three (3) sides and a two (2) inch marginal space for binding on the left side.

Shop drawings must be numbered consecutively and must accurately and distinctly present the following:

(1) All working and erection dimensions.

(2) Arrangement and sectional views (minimum of two directional views).

(3) Necessary details, including complete information for making connections between work under this contract and work under other contracts.

(4) Types of materials, and their properties.

(5) Manufacturer data, details, and manufacturer’s recommendations.

(6) General notes, loading diagrams, design criteria and assumptions, and construction procedures.

(G) Each shop drawing must be dated and contain:

(1) The name of this project and this contract number.

(2) The description name of classified contract item number or numbers under which it is or they are required.

(3) The locations or points at which the sheeting is to be installed in the work.

(4) For resubmissions, changes must be noted with a revision mark and number, and changes must be clouded.

(H) All sheeting submissions must reflect the means and methods chosen by the Contractor and approved by the Engineer. Whenever steel sheeting systems (including trench boxes, frames and plates, etc.) are submitted which would render the crossing of utilities (i.e., water mains and sewers) impossible, the Contractor must also submit, for approval, a system which can be utilized to permit such crossings (i.e., wood sheeting).

(I) The submission of multiple sheeting systems must be kept to a minimum. Whenever the Contractor submits multiple systems, the submissions must be accompanied with a Location Plan shop drawing to indicate the exact location where these various systems are to be installed. Since the approval of multiple systems will delay the sheeting approval process, the Contractor is requested to submit a schedule indicating the time frame that these systems are required. In addition, the Contractor will be required to install these multiple systems at the locations indicated on the submitted Location Plan. Should the Contractor request to change the sheeting system at any particular location, the Contractor will be required to resubmit the sheeting drawing, for approval, even though the revised sheeting system may have been approved at another location within the project area. The Contractor is reminded that the approval time for any given sheeting system may require up to four (4) weeks.

**40.05.6 DESIGN CRITERIA**

The following criteria must be used in calculating the required sheeting, bracing, and/or decking systems.

(A) All struts and walers subjected to compression forces must be designed with a factor of safety of two (2.0). The factor of safety of two (2.0) must be a value above and beyond the allowable value for compressive stresses for steel as designated in the "AISC Manual of Steel Construction", and for wood as designated in the "National Design Specification (NDS) for Stress-Grade Lumber and its Fastening". All other allowable stresses (not including compression members) may be increased by thirty-three and one-third (33-1/3%) percent where sheeting and bracing is deemed a temporary structure. The 33-1/3% overstress is not allowed in conjunction with NDS adjustment factors for lumber and fasteners.

(B) A factor of safety must be used to determine the minimum embedment for sheeting as follows:

Vertical Timber - 15%

Soldier Beams - 20%

Steel Sheeting - 30%

(C) Embedment must be calculated in accordance with the procedures and standard minimum load diagrams specified herein. The maximum allowable embedment for vertical timber sheeting must not exceed three feet six inches (3'6"). The minimum embedment must be two (2) feet.

(D) The Contractor is advised that the maximum allowable bending stress ($F_b$) for all timber members must not exceed one thousand seven hundred fifty (1,750) pounds per square inch. If the Contractor elects to use a bending stress higher than $F_b$ = 1,750-psi, written certification of bending stress test results must be submitted to the Engineer prior to use of such material in construction.

(E) Where it is anticipated that heavier crane or equipment loads will fall within the influence line of the trench, design loads must be increased accordingly.

(F) The Contractor must compute and include in the Contractor’s submission of drawings and calculations the following for all members and connections:

(1) Maximum bending stress

(2) Maximum horizontal and vertical shear stress

(3) Compression perpendicular to grain

(4) Maximum compressive stress

(5) Maximum combined stress

(6) Deflections

(G) DECKING

(1) Unless otherwise specified in the contract documents or approved in writing by the Engineer, the minimum live load on decking must be AASHTO HS20 or Contractor's equipment or heaviest truck loading (i.e., concrete trucks), whichever is greater, plus an impact factor of thirty-three (33) percent.

(2) Unless otherwise approved, timber mats must extend a minimum of three (3) feet from sheeting line on either side of trench.

(3) Unless otherwise approved, sheeting below the decking must be designed for the larger of:

(a) The actual surcharges from cranes, equipment, materials, and other loads; or

(b) A minimum one thousand (1,000) pounds per square foot surcharge load.

(H) Maximum trench widths shown on sheeting details must not exceed those allowed by the standards or specifications. If the trench width exceeds the maximum trench width indicated in the Sewer Design Standards, the Contractor will not be allowed to impact any City or private utility facilities due to the increased width, and will be responsible for any utility interferences, as well as any associated costs of excavation, backfilling, sheeting and bracing, surface restorations, and incidentals, as related to the installation and removal of these sheeting systems.

(I) The Contractor must provide an individual cross-sectional sheeting (trench) detail for each size water main pipe and sewer conduit to be constructed unless permission to do otherwise is granted. Where decking is used with sheeting systems, the cross-sectional details must be provided in at least two directions.

(J) Where the water table lies above the subgrade of trench and a well point or deep well dewatering system is not used, the Contractor must include the effect of hydrostatic loading in calculations for both watertight and non-watertight sheeting.

(K) Sheeting details must accurately depict actual field operations. The Contractor must be restricted to a maximum five (5) feet deep pilot cut and all details must reflect this. Additional braces and wales may be required to install sheeting due to the five (5) feet maximum pilot cut restriction. The Contractor must not assume that additional pilot cut depths will be allowed.

(L) Sheeting systems must have rotational restraints at all member connections.

**40.05.7 REMOVAL OF SHEETING**

All sheeting design and requirements must be in strict conformance with this section and all appropriate Addenda to the specifications.

Unless otherwise specified in the plans or these specifications, the Contractor must remove all sheeting and bracing throughout this project.

(A) The sheeting must be removed in lifts during the backfilling operation in order to permit proper placement and compaction of material against the structure and the earth bank. This work must be accomplished in conjunction with the removal of wales and braces. The lifts for sheeting must not exceed the specified or otherwise approved depth of compaction layer.

(B) The Contractor must submit to the Engineer, for approval, the Contractor's method for installation and removal of sheeting and the method for backfilling the trench. The submission must specify if there are any location(s) where sheeting cannot be removed and detail the reasons why the sheeting cannot be removed. The submission must be signed by and carry the seal of a New York State Licensed Professional Engineer. These methods must be strictly adhered to.

(C) The Contractor is advised that the Contractor will be responsible for and must, solely at the Contractor's own expense, repair, replace, and/or relocate all City owned utilities that are damaged and/or disturbed due to the Contractor's removal of sheeting operation.

(D) If the Contractor is required to leave the sheeting system in place in order to protect City owned utility crossings and structures, payment will be made in accordance with **Subsection 40.05.2(A)** and **Subsection 40.05.2(B)**.

(E) This section must not be construed to relieve the Contractor of the Contractor's obligation under the contract to maintain, protect, and support (temporarily and permanently) all City owned utilities within the influence lines of the excavated trenches. The Contractor in accordance with the standards of the agencies having jurisdiction thereof must perform such maintenance, protection, and support.

(F) The cost of maintenance, protection, and support (temporarily and permanently) of City owned utilities must be included in the prices bid for all items for which there are bid prices.

(G) If a soldier beam and lagging sheeting system is utilized, then all parts of the system (i.e., soldier beams, bracing, wales, and lagging) must be removed.

(H) There must be no additional payment made for repairing, replacing, and/or relocating City owned utilities that may be damaged and disturbed due to the Contractor's removal of sheeting operation, or for work performed by the Contractor as directed in **Subsection 40.05.7(E)** above.

### 40.05.8 NO SEPARATE PAYMENT

No separate payment or additional payment will be made for the sheeting and bracing of trenches and excavation of water mains larger than 20-inches in diameter and appurtenances thereto including valve chambers, regulator chambers, etc.; and for the sheeting and bracing of trenches and excavation of all sewer conduits and appurtenances thereto including manholes, chambers, catch basins, etc. The cost of all labor, material, plant, equipment, and insurance necessary or required to furnish and install all timber and steel sheeting together with all necessary wales, bracing, lagging, soldier beams, etc., excavation for the placing of sheeting, backfill, and compaction behind sheeting to prevent loss of ground, cut off of sheeting as specified, together with all work incidental thereto, all in accordance with the plans and specifications and as directed by the Engineer, must be deemed included in the prices bid for the respective contract items.

Separate payment or additional payment will only be made for the sheeting of water mains 20-inches and smaller in diameter accordance with Item Numbers under **Section 70.91**.