

WATER AND SEWER LINE CONSTRUCTION STANDARDS AND POLICIES

Established by the
ILLINOIS DEPARTMENT OF AGRICULTURE

The following standards and policies will serve to minimize the negative agricultural impacts that may result due to water and sewer line construction.

The standards and policies apply to construction activities occurring partially or wholly on privately owned agricultural land. They do not apply to construction activities occurring on highway or railroad right-of-way, or on publicly owned land. The only exceptions are the construction standards relating to the repair of drainage tile (Item No. 3). The tile line construction standards shall be implemented regardless of where drainage tile is encountered.

Conditions

The mitigative actions specified in the construction standards and policies will be implemented in accordance with the conditions listed below.

- A. All mitigative actions are subject to change by Landowners, provided such changes are acceptable to the Project sponsor.
- B. The Company may negotiate with Landowners to carry out the mitigation actions that Landowners wish to perform themselves. The Landowners will receive the area commercial rate for their labor and machinery costs.
- C. All mitigative actions, unless others specified, will be implemented within 45 days of completion of water or sewer line facilities on any affected property, weather and Landowners permitting. Temporary repairs will be made by the **Company** during the construction process as needed to minimize the risk of additional property damage that may result from an extended construction time period.
- D. All mitigative actions will extend to associated future construction, maintenance and repairs.
- E. The Company will provide a copy of the IDOA's **Water and Sewer Line Construction Standards and Policies** to all owners of agricultural land that will be impacted by water and/or sewer line construction and will do at the time of easement contract negotiations.

Definitions

- Agricultural land - Land used for cropland, pastureland, managed woodlands, truck gardens, orchards, nurseries, and other related agricultural enterprises dependent upon soil integrity.
- Company - The entity proposing the construction of water or sewer lines and their related appurtenances.
- Cropland - Land used for growing row crops, small grains or hay; includes land which was formerly used as cropland but is currently in a government set-aside or conservation reserve program.
- Drainage Tile - Artificial subsurface drainage system including, but not limited to, clay and concrete tile, vitrified sewer tile, corrugated plastic tubing, and stone drains.
- Landowner - Person(s) responsible for making decisions regarding the restoration of the land adversely impact by a water or sewer line.
- Parent Material - Is the underlying geological material (generally bedrock a superficial or drift deposit) in which soil horizons form. Soils typically inherit a great deal of structure and minerals from their parent material, and, as such, are often classified based upon their contents of consolidated or unconsolidated mineral material that has undergone some degree of physical or chemical weathering and the mode by which the materials were most recently transported.
- Prime farmland - Agricultural land comprised of soils defined by the USDA Natural Resources Conservation Service as being "Prime" soils (generally considered the most productive soils with the least input of nutrients and management).
- Right-of-Way (ROW) - Includes the permanent and temporary easements that the Company acquires for the purpose of construction water or sewer lines across privately owned land.
- Water or Sewer Line - Includes water transmission and distribution lines, sewer trunk lines, sewer gravity flow lines, interceptors or force mains and any related appurtenances.

WATER AND SEWER LINE CONSTRUCTION STANDARDS AND POLICIES

1. Water and Sewer Line Depth

- A. All water and sewer lines which are placed in trenches 24 inches in width or less will be buried a minimum of 42 inches (60 inches is suggested by the IL Dept of Agriculture) of top cover where they cross cropland.
- B. All water and sewer lines that are placed in trenches greater than 24 inches in width will be buried with 60 inches of topcover when they cross cropland.
- C. In terrain where bedrock prevents the placement of any water or sewer lines at the depths specified in 1.A. or 1.B above, the water or sewer lines will be buried as deep as is practicable and feasible.

2. Topsoil Replacement

The following standards apply only when water and sewer lines are buried in trenches that are greater than 24 inches.

- A. The topsoil depth shall be determined by a properly qualified soil scientist or soil technician who will set stakes or flags every 200 feet along the right-of-way identifying the depth of topsoil to be removed.
- B. The actual depth of the topsoil, not to exceed 36 inches, will first be stripped from the area to be excavated above the pipeline and from the adjacent subsoil storage area. The topsoil will be stored in a windrow parallel to the pipeline trench in such a manner that it will not become intermixed with subsoil materials.
- C. All subsoil material that is removed from the trench will be placed in a second windrow that is separate from the topsoil windrow.
- D. In backfilling the trench and other excavated areas, the stockpiled subsoil material will be placed back into the trench first. The topsoil will be replaced last so that it remains the top layer of soil. Parent material is not rooting material and should never be spread over the ROW. Any parent material encountered with excavation should be hauled off the right-of-way and disposed of as agreed by the Company and the Landowner.
- E. The topsoil and subsoil must be replaced within the trench and other excavated area so that after settling occurs, the topsoil original depth and contour (with an allowance for settling) will be restored. The same should apply where excavations are made for road, stream, drainage ditch, or other crossings. In no instance will the topsoil materials be used for any other purpose.
- F. The subsoil displaced by the water or sewer line should be hauled off the Landowner's premises or disposed of on the Landowner's premises at a location that is acceptable to the Landowner.

3. Repair of Damaged Tile Lines

If underground drainage tile is damaged by water or sewer line construction, it shall be repaired in a manner that assures the tile line's proper operation at the point of repair. The following standards and policies shall apply to the tile line repairs.

- A. The Company will endeavor to locate all tile lines within the right of way prior to water or sewer line construction so repairs can be made if necessary. The Company will contact affected Landowners/Tenants for their knowledge of the tile line location prior to any water or sewer line installation. All identified tile lines will be staked or flagged prior to construction to alert construction crews to the possible need for tile line repairs.
- B. All tile lines that are damaged, cut, or removed shall be staked or flagged with the stakes or flags placed in such a manner they will remain visible until the permanent repairs are completed.
- C. If water is flowing through any damaged tile line, the tile line will be immediately and temporarily repaired until such time that permanent repairs can be made. If the tile lines are dry and water is not flowing, temporary repairs are not required if the permanent repairs can be made within 14 days of the time damage occurred; however, the exposed tile lines will be screened or otherwise protected to prevent the entry of foreign materials, small mammals, etc. into the tile lines.
- D. Where tile lines are severed by the pipeline trench, repairs shall be made using the IDOA Tile Line Repair Drawings, Temporary and Permanent, Figures 1 and 2.
- E. There will be a minimum of one foot of separation between the tile line and the pipeline whether the pipeline passes over or under the tile line.
- F. The original tile line alignment and gradient shall be maintained. A laser transit shall be used to ensure the proper gradient is maintained. A laser operated tiling machine shall be used to install or replace tiling segments of 100 linear feet or more.
- G. Before completing permanent tile repairs, all tile lines will be probed or examined by other suitable means on both sides of the trench for their entire length within any work areas to check for tile that might have been damaged by vehicular traffic or construction equipment. If tile lines are found to be damaged, they must be repaired so they operate as well after construction as before the construction began.
- H. All permanent tile line repairs must be made within 14 days of the time damage occurred on the Landowner's property, weather and soil conditions permitting.
- I. Following completion of the pipeline, the Company will be responsible for correcting all tile line repairs that fail due to pipeline construction, provided those repairs were made by the Company. The Company will not be responsible for tile line repairs that the Company pays the Landowner to perform.

4. Installation of Additional Tile Lines

- A. The Company shall be responsible for installing such additional drainage tile and other drainage measures as are necessary to properly drain wet areas on the permanent and temporary easements caused by the construction and/or existence of the pipeline.

- B. Where the pipeline's route parallels an existing pipeline within a 200-foot perpendicular offset, the Company shall be responsible for installing tile and/or other drainage measures, as necessary, to properly drain the area between the two pipelines to the extent the wet areas between the pipelines are caused by the construction and/or existence of the pipeline.
- C. It is presumed that any wet areas located in permanent and temporary easements and/or between the two parallel pipelines are caused by the construction and/or existence of the new pipeline unless the Company can prove that the construction and/or existence of the new pipeline is not the cause of the wet areas.

5. Rock Removal

The following rock removal procedures only pertain to rocks found in the uppermost 42 inches of soil, the common freeze zone in Illinois.

- A. Before replacing any topsoil, all rocks greater than 3 inches in any dimension will be removed from the surface of all exposed subsoil and from all subsoil that is replaced back in the trench.
- B. As the topsoil is replaced, all rocks greater than 3 inches in any dimension will be removed from the topsoil.
- C. If trenching, blasting, or boring operations are required through rocky terrain, suitable precautions will be taken to minimize the potential for oversized rocks to become interspersed with adjacent soil material.
- D. Rocks and soil containing rocks removed from the subsoil areas, topsoil, or from any excavations, will be hauled off the Landowner's premises or disposed of on the Landowner's premises at a location that is mutually acceptable to the Landowner and the Company.

6. Removal of Construction Debris

All construction-related debris and material that are not an integral part of the water or sewer line will be removed from the Landowner's property. Such material to be removed would include litter generated by the construction crews. Litter shall be removed daily.

7. Compaction, Rutting, Fertilization, Liming

- A. After the topsoil has been replaced, all areas that were traversed by vehicles and construction equipment will be ripped at least 16 inches deep and all pasture and woodland will be ripped at least 12 inches deep. The existence of tile lines or underground utilities may necessitate less depth. The entire right-of-way will then be disked. Decompaction shall be conducted according to the guideline provided in Appendices A and B.
- B. One disking pass will be made across any agricultural land that is ripped.
- C. All ripping will be done at a time when the soil is dry enough for normal tillage operations to occur on undisturbed farmland adjacent to the areas to be ripped.

D. The Company will restore all rutted land to its original condition.

8. Land Leveling

- A. Following the completion of a water or sewer line, the Company will restore any right-of-way to its original pre-construction elevation and contour should uneven settling occur, or surface drainage problems develop as a result of a water or sewer line's construction.
- B. The Company will provide the Landowners with a telephone number and address that may be used to alert the Company of the need to perform additional land leveling services.
- C. If, in the future, uneven settling occurs or surface drainage problems develop as a result of the sewer or water line construction, the Company will provide such land leveling services within 45 days of a Landowner's written notice, weather and soil conditions permitting.
- D. If there is any dispute between the Landowner and the Company as to what areas need additional land leveling beyond that which was done at the time of construction, it shall be the Company's responsibility to disprove the Landowner's claim that additional land leveling is warranted.

9. Construction During Wet Weather

Except as provided below, construction activities are not allowed on farmland where normal farming operations, such as plowing, disking, planting or harvesting, cannot take place due to wet soils. Wet weather conditions are to be determined on a field by field basis and not for a whole project.

- A. Construction activities on prepared surfaces, surfaces where topsoil and subsoil have been removed, heavily compacted in preparation, or otherwise stabilized (e.g. through cement mixing) may occur at the discretion of the Company in wet weather conditions.
- B. Construction activities on unprepared surfaces will be done only when work will not result in rutting creating a mixing of subsoil and topsoil. Determination as to the potential of subsoil and topsoil mixing will be in consultation with the underlying Landowner, or, if approved by the Landowner, his/her designated Tenant

10. Backfill Profile and Trench Crowning

- A. In all agricultural land areas, trench crowning shall occur during the trench backfilling operation using subsoil materials over the trench to allow for trench settling, to be followed by topsoil replacement. Due to the increased elevation of the crown compared to the rest of the right-of-way, surface drainage across the trench may be hindered until the crown has settled completely.
- B. Surface drainage should not be permanently blocked or hindered in any way. If excess soil is encountered, it will be removed offsite to prevent ridging, unless the Landowner and the Company agree otherwise. Adding additional soil to the crown over the trench in excess of that required for settlement will not be permitted. In areas where minor trench settling occurs after topsoil spreading, land leveling or imported topsoil shall be

used to fill each depression. In areas where major trench settling occurs after topsoil spreading, and land leveling cannot be utilized; imported topsoil shall be used to fill each depression of significant depth. Topsoil from the adjacent agricultural land outside of the construction footprint shall not be used to fill the depressions, unless approved by the Landowner.

- C. In agricultural areas where the materials excavated during trenching are insufficient in quantity to meet backfill requirements, the soil from any agricultural land adjacent to the trench and construction zone shall not be used as either backfill or surface cover material. Under no circumstances shall any topsoil materials be used for pipe padding material or trench backfill. In situations where imported soil materials are employed for backfill on agricultural lands, such materials shall be of similar texture and quality to the existing soils on site. Imported soils should be free from noxious weeds and other pests to the extent possible.

11. Prevention of Soil Erosion

- A. The Company will work with Landowners to prevent excessive erosion on land disturbed by construction. Reasonable methods will be implemented to control erosion. This is not a requirement; however, if the land across which a water or sewer line is constructed is bare cropland that the land owner intended to leave bare until the next crop is planted.
- B. If the Landowner and Company cannot agree upon reasonable methods to control erosion on the Landowner's right-of-way, the Company will follow the recommendation of the appropriate county Soil and Water Conservation District if the Landowner so requests.

12. Repair of Damaged Soil Conservation Practices

All soil conservation practices (such as terraces, grassed waterways, filter strips, concrete structure, dams, etc.) that are damaged by water or sewer line construction will be restored to reflect at least a substantially similar condition to its preconstruction condition in consultation with the local SWCD and in accordance with the USDA Natural Conservation Service Standards.

- A. If the Landowner and Company cannot agree upon a reasonable method to repair conservation practices, on the Landowner's right-of-way, the recommendations of the appropriate county Soil and Water Conservation District (SWCD) shall be considered by a Company and the Landowner.
- B. The work set forth in this section will be done within 45 days, weather and Landowner permitting, after the pipeline has been constructed.

13. Damages to Private Property

- A. The Company will reasonably compensate Landowners for any construction-related damages caused by the Company that occur on or off the established sewer or water line right-of-way.
- B. Compensation for damages to private property caused by the Company shall extend beyond the initial construction of the sewer and water line, to include those damages caused by the Company during future construction, operation, maintenance, and repairs relating to the sewer and water line.

- C. The Company will reimburse the Landowner, on a timely basis, for all agricultural production inputs (fertilizers of all types and kinds) needed to restore crop productivity to the right of way, the temporary work space, or any other portion of Landowner's property where crop yields are diminished by reason of the construction, repair, maintenance and inspection activities of the Company. This shall be a continuing obligation of the Company for as long as and to the extent that Landowner can reasonably demonstrate diminished yields resulting from the above activities of the Company. Also, the Company shall make available to Landowner the name and contact information of a person acting on behalf of Company with whom the Landowner can communicate information with regard to diminished crop yields and need for reimbursement of cost of agricultural inputs. That person will have a background related to soil productivity and crop production.

14. Clearing of Trees and Brush from the Easement

- A. If the trees to be removed are from the right-of-way the Company will consult with the Landowner to see if there are trees of commercial or other value to the Landowner.
- B. If there are trees of commercial or other value to the Landowner, the Company will allow the Landowner the right to retain ownership of the trees with the disposition of the trees to be negotiated prior to the commencement of land clearing.
- C. Unless otherwise restricted by federal, state or local regulations, the Company will follow the Landowner's regarding the removal and disposal of trees, brush and stumps of no value to the Landowner by burning, burial, etc., or complete removal from any affected property.

15. Interference with Irrigation Systems

- A. If a water or sewer line intersects an operational (or soon to be operational) spray irrigation system, the Company will establish with the Landowner an acceptable amount of time the irrigation system may be out of service.
- B. If, as result of sewer or water line construction activities, an irrigation system interruption results in crop damages, either on the water or sewer right-of-way or off the right-of-way, the Landowner will be compensated for all such crop damages.
- C. If it is feasible and mutually acceptable to the Company and the Landowner, temporary measures may be implemented to allow an irrigation system to continue to operate across land on which a water or sewer line is being constructed.

16. Ingress and Egress Routes

Prior to any water or sewer line construction, the Company and the Landowner will reach a mutually acceptable agreement on the route that will be utilized for entering and leaving the water or sewer line right-of-way should access to the right-of-way not be practical or feasible from adjacent segment of the water or sewer line right-of-way or from public highway or railroad right-of-way.

17. Temporary Roads

- A. The location of temporary roads to be used for construction purposes will be negotiated with the Landowner.
- B. The temporary roads will be designed to not impede surface drainage will be built to minimize soil erosion on new temporary roads.
- C. Upon abandonment, temporary roads may be left intact through mutual agreement of the Landowner and the Company unless otherwise restricted by federal, state, or local regulations.
- D. If the temporary roads are to be removed, the right-of-way upon which the temporary roads are constructed will be returned to their previous use(s) and restored to equivalent-condition(s) as existed prior to their construction. All temporary access roads that are removed shall be ripped to a depth of 16 inches. All ripping will be done consistent with Items 7.A. through 7.F.

18. Weed Control

- A. On any right-of-way over which the Company has jurisdiction as the surface use (i.e., wellheads, pump or lift stations, valve sites, etc.), the Company will provide weed control in a manner that prevents the spread of weeds onto adjacent lands used for agriculture purposes. Spraying will be done by a pesticide applicator who is appropriately licensed for doing such work in the State of Illinois.
- B. The Company will be responsible for reimbursing all reasonable costs incurred by owners of land adjacent to surface facilities when the Landowners must control weeds on their land, which can be determined to have spread from land accommodating water or sewer line surface facilities, should the Company fail to do so after being given written notice and a 45-day opportunity to respond.

19. Pumping of Water from Open Trenches

- A. In the event it becomes necessary to pump water from open trenches, Company will pump the water in a manner which will avoid damaging adjacent agricultural land, crops and/or pasture. Such damages include, but are not limited to, inundation of crops for more than 24 hours, deposition of sediment in ditches the deposition of sediment in ditches and other water courses, and the deposition of subsoil sediment and gravel in fields and pastures.
- B. If it is impossible to avoid water-related damages as described in 19.A. above, the Company will reasonably compensate the Landowners for the damages or will correct the damages to restore the land, water courses, etc.; to their pre-existing conditions.
- C. All pumping of water shall comply with existing drainage laws, local ordinances relating to such activities and provisions of the Federal Clean Water Act.

20. Aboveground Facilities

Locations for aboveground facilities shall be selected in a manner which will be as unobtrusive as reasonably possible to ongoing agricultural activities occurring on the lands adjacent to the facilities. First priority shall be made to locating aboveground facilities on

right-of-way that is not used as cropland. If this is not feasible, such facilities shall be located so as to incur the least hindrance to the adjacent cropping operations (i.e., located in field corners or areas where at least one side is not used for cropping purposes).

21. Advance Notice of Access to Private Property

- A. The Company will provide the Landowner or tenant with a minimum of 24 hours prior notice before accessing his/her property for the purpose of constructing a water or sewer line.
- B. Prior notice shall first consist of a personal contact or a telephone contact, whereby the Landowner or tenant is informed of the Company's intent to access the land. If the Landowner or tenant cannot be reached in person or by telephone, the Project Sponsor will mail or hand deliver to the Landowner or tenant's home a dated written notice of the Project Sponsor's intent. The Landowner or tenant need not acknowledge receipt of the written notice before the Project Sponsor can enter the Landowner's property.

22. Reporting of Inferior Agricultural Impact Mitigation Work

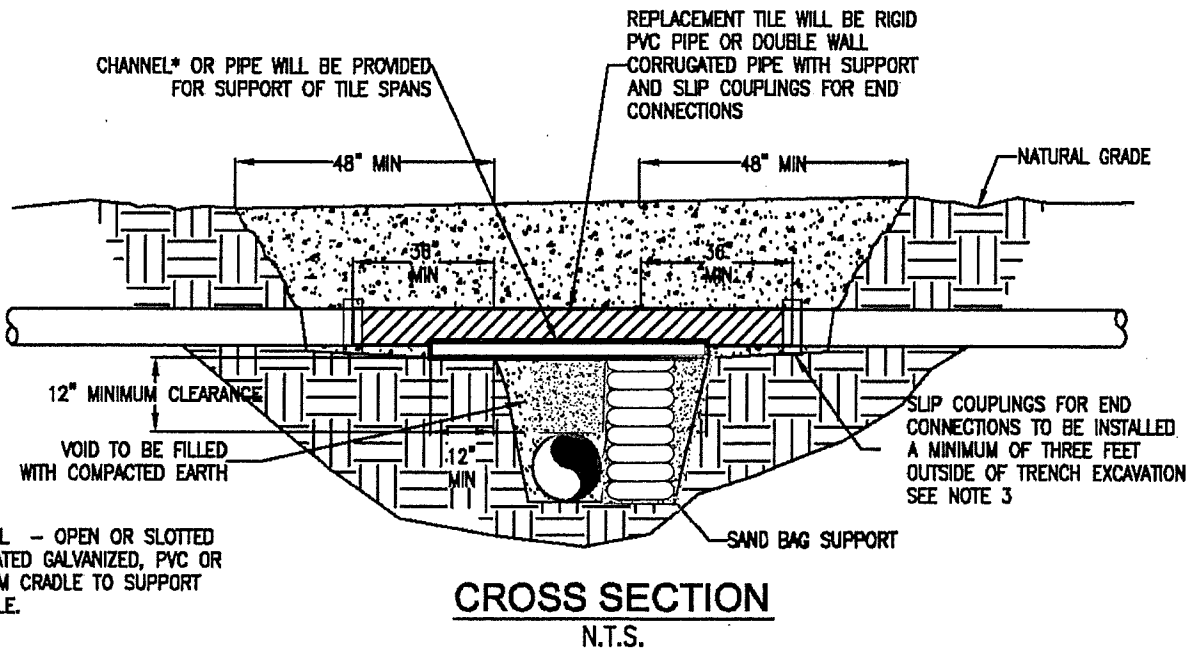
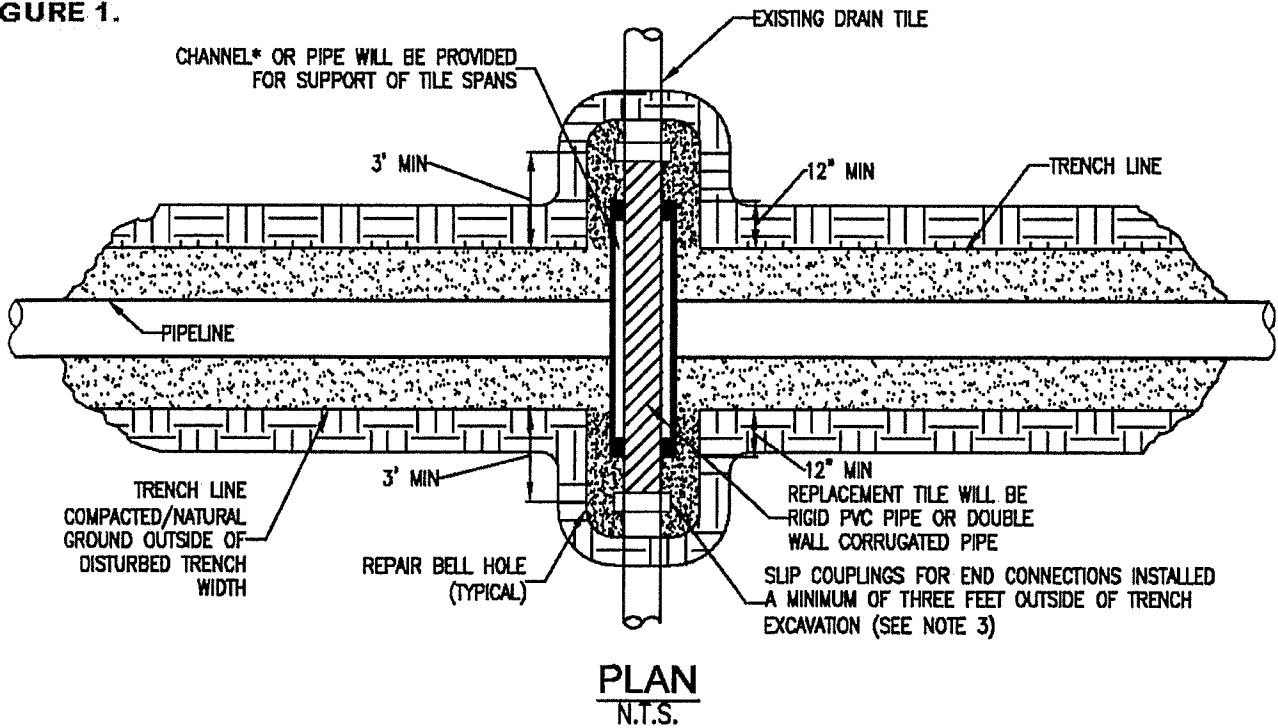
No later than 45 days prior to the commencement of the pipeline construction across a Landowner's property, the Company will provide the Landowner with a toll-free number the Landowner can call to alert the Company should the Landowners observe inferior agricultural impact mitigation work which is being done or has been carried out on his/her property.

23. Indemnification

The Company will indemnify all owners and farm tenants of agricultural land upon which such sewer line or water line is installed, their heirs, successors, legal representatives, assigns (collectively "Indemnitees"), from and against all claims by third parties losses incurred thereby, and reasonable expenses, resulting from or arising out of personal injury, death, injury to property, or other damages or liabilities of any sort related to the design, laying, maintenance, removal, repair, use or existence of such pipeline, whether heretofore or hereafter laid, including damages caused by such pipeline or any of its appurtenances and the leaking of its contents, except where claims, injuries, suits, damages, costs, losses, and expenses are caused by the negligence or intentional acts, or willful omissions of such Indemnitees provided further that such Indemnitees shall tender any such claim as soon as possible upon receipt of notice thereof to the Company.

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FIGURE 1.

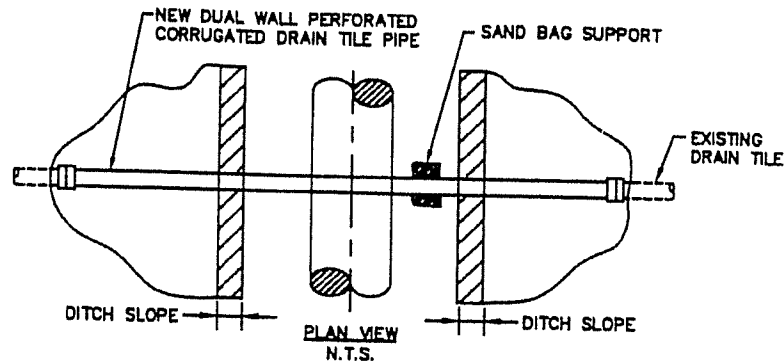


*CHANNEL - OPEN OR SLOTTED CORRUGATED GALVANIZED, PVC OR ALUMINUM CRADLE TO SUPPORT DRAIN TILE.

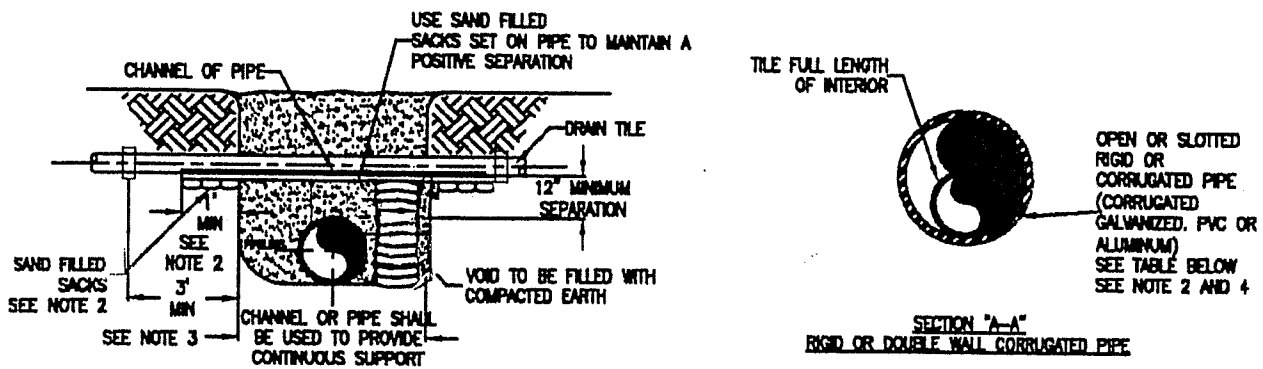
- NOTE:**
1. IMMEDIATELY REPAIR TILE IF WATER IS FLOWING THROUGH TILE AT TIME OF TRENCHING. IF NO WATER IS FLOWING AND TEMPORARY REPAIR IS DELAYED, OR NOT MADE BY THE END OF THE WORK DAY, A SCREEN OR APPROPRIATE 'NIGHT CAP' SHALL BE PLACED ON OPEN ENDS OF TILE TO PREVENT ENTRAPMENT OF ANIMALS ETC.
 2. CHANNEL OR PIPE (OPEN OR SLOTTED) MADE OF CORRUGATED GALVANIZED PIPE, PVC OR ALUMINUM WILL BE USED FOR SUPPORT OF DRAIN TILE SPANS.
 3. INDUSTRY STANDARDS SHALL BE FOLLOWED TO ENSURE PROPER SEAL OF REPAIRED DRAIN TILES.

TEMPORARY DRAIN TILE REPAIR

FIGURE 2.



PLAN VIEW



END VIEWS

MINIMUM SUPPORT TABLE			
TILE SIZE	CHANNEL SIZE	PIPE SIZE	
3"	4" @ 5.4 #11	4"	STD. WT.
4"-5"	5" @ 8.7 #11	8"	STD. WT.
8"-9"	7" @ 9.8 #11	9"-10"	STD. WT.
10"	10" @ 15.3 #11	12"	STD. WT.

NOTE:

1. TILE REPAIR AND REPLACEMENT SHALL MAINTAIN ORIGINAL ALIGNMENT GRADIENT AND WATER FLOW TO THE GREATEST EXTENT POSSIBLE. IF THE TILE NEEDS TO BE RELOCATED, THE INSTALLATION ANGLE MAY VARY DUE TO SITE SPECIFIC CONDITIONS AND LANDOWNER RECOMMENDATIONS.
2. 1'-0" MINIMUM LENGTH OF CHANNEL OR RIGID PIPE (OPEN OR SLOTTED CORRUGATED GALVANIZED, PVC OR ALUMINUM CRADLE) SHALL BE SUPPORTED BY UNDISTURBED SOIL, OR IF CROSSING IS NOT AT RIGHT ANGLES TO PIPELINE, EQUIVALENT LENGTH PERPENDICULAR TO TRENCH. SHIM WITH SAND BAGS TO UNDISTURBED SOIL FOR SUPPORT AND DRAINAGE GRADIENT MAINTENANCE (TYPICAL BOTH SIDES).
3. DRAIN TILES WILL BE PERMANENTLY CONNECTED TO EXISTING DRAIN TILES A MINIMUM OF THREE FEET OUTSIDE OF EXCAVATED TRENCH LINE USING INDUSTRY STANDARDS TO ENSURE PROPER SEAL OF REPAIRED DRAIN TILES INCLUDING SLIP COUPLINGS.
4. DIAMETER OF RIGID PIPE SHALL BE OF ADEQUATE SIZE TO ALLOW FOR THE INSTALLATION OF THE TILE FOR THE FULL LENGTH OF THE RIGID PIPE.
5. OTHER METHODS OF SUPPORTING DRAIN TILE MAY BE USED IF ALTERNATE PROPOSED IS EQUIVALENT IN STRENGTH TO THE CHANNEL/PIPE SECTIONS SHOWN AND IF APPROVED BY COMPANY REPRESENTATIVES AND LANDOWNER IN ADVANCE. SITE SPECIFIC ALTERNATE SUPPORT SYSTEM TO BE DEVELOPED BY COMPANY REPRESENTATIVES AND FURNISHED TO CONTRACTOR FOR SPANS IN EXCESS OF 20', TILE GREATER THEN 10" DIAMETER, AND FOR "HEADER" SYSTEMS.
6. ALL MATERIAL TO BE FURNISHED BY CONTRACTOR.
7. PRIOR TO REPAIRING TILE, CONTRACTOR SHALL PROBE LATERALLY INTO THE EXISTING TILE TO FULL WIDTH OF THE RIGHTS OF WAY TO DETERMINE IF ADDITIONAL DAMAGE HAS OCCURRED. ALL DAMAGED/DISTURBED TILE SHALL BE REPAIRED AS NEAR AS PRACTICABLE TO ITS ORIGINAL OR BETTER CONDITION.

PERMANENT DRAIN TILE REPAIR

Appendix A.

Guidelines for Conducting Proper and Successful Decompaction

1. Decompaction is required when all three conditions apply.
 - A. the area has been trafficked or traversed by vehicles or construction equipment, and
 - B. the soil penetrometer readings are 300 psi or greater, and
 - C. The soil strength (psi) in the right-of-way area is greater than that of the non-trafficked area.
2. An Environmental and/or Agricultural Inspector (AI), with experience and training in the proper identification of compacted soil and operation methods of deep decompaction tools is required to observe the daily operation of the ripper/subsoiler to ensure the conditions are appropriate for decompaction efforts and that the proper equipment is utilized and that equipment is set-up and operated correctly.
3. To achieve the most effective shatter of the compacted soil the following guidelines have been established:
 - A. Conduct ripping when the soil is dry. Follow the "Soil Plasticity Test Procedures" detailed in Appendix B to determine if soil conditions are adequately dry to conduct decompaction efforts.
 - B. Deep ripping shall be conducted using a ripper or subsoiling tool with a shank length of no less than 18 inches and a shank spacing of approximately the same measurement as the shank length.
 - C. Use a ripper with a knife length of no less than 2 inches more than the desired depth of decompaction.
 - D. To best promote revegetation and restore crop production, a total depth of 30 or more inches of soil (topsoil plus subsoil) is required.
 - E. The minimum depths of decompaction stated above in 3.D. are required where possible. A safe distance from sub-surface structures (tile drains, pipelines, buried utilities, bedrock, etc.) must be maintained at all times. Where such structures exist, a lesser depth of decompaction will be required to prevent damage to equipment and the structures as well as to maintain a safe work environment. The allowable decompaction depth in these instances will be determined on a site by site basis.
 - F. When the knives are in the soil to the desired depth, the tongue of the ripper should be parallel to the surface of the ground.
 - G. Select a tractor that has enough horsepower to pull the ripper at a speed of 1.5 to 2 mph and whose footprint is of equal or lesser width than the ripper. Tracked equipment is preferred and typically required to achieve this criteria.
 - H. The ripper shanks should not create ruts, channels, or mixing of the sub-soil with topsoil. A speed of 1.5 to 2 mph is recommended to minimize the risk of rutting and soil mixing. The ideal operating speed can vary with soil characteristics, tractor and ripping tool used. An excessive travel speed will often increase mixing of soil horizons.
 - I. When the equipment is set up and operated correctly, the ripper should create a wave across the surface of the ground as it lifts and drops the soil.

- J. Make one ripping pass through the compacted area. Using a penetrometer, the AI will measure the PSI between the ripped knife tracks to determine if the single ripping pass was successful. Additional passes should only be used where needed as they may reduce the effectiveness of the ripping by recompacting the soil shattered in the previous pass.
- K. If the first pass does not successfully decompact the soil, additional passes will be needed. Should multiple passes of the ripper be needed to achieve decompaction between the knives tracks of the ripping tool, the subsequent passes should be positioned so the knife tracks from the previous pass are split by the second pass. If three or more passes have been made and sufficient decompaction has not yet been achieved the AI may choose to halt further decompaction efforts in that area until conditions improve or better methods are determined.
- L. Following ripping, all stone and rock three or more inches in size which has been lifted to the surface shall be collected and removed from agricultural areas.
- M. After ripping has been conducted, do not allow unnecessary traffic on the ripped area.
- N. In agricultural lands and croplands that will not be replanted to vegetation by the Company, recommend to landowners to plant a cover crop (cereal rye, clover, alfalfa, tillage radish, turnips, etc.) following decompaction. Reduced compaction created by the ripper pass will not remain over time without subsequent root penetration. Root penetration into the shattered soil is necessary to establish permanent stabilized channels to conduct air and water into the soil profile. Two good sources for landowner cover crop education are <http://www.mccc.msu.edu/CCinfo/cropbycrop.html> and <http://mcccdev.anr.msu.edu/>. For local expertise, consult with your county's Soil and Water Conservation District /USDA Natural Resource Conservation Service (NRCS) office for cover crop selection and compliance with NRCS planting deadlines.

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Appendix B.

Soil Plasticity Test Procedures

The Agricultural Inspector will test the consistency of the surface soil to a depth of approximately 4 to 8 inches using the Field Plasticity Test procedure developed from the *Annual Book of ASTM Standards, Plastic Limit of Soils* (ASTM D-4318).

1. Pull a soil plug from the area to be tilled, moved, or trafficked to a depth of 4-8 inches.
2. Roll a portion of the sample between the palms of the hands to form a wire with a diameter of one-eighth inch.
3. The soil consistency is:
 - A. Tillable (able to be worked) if the soil wire breaks into segments not exceeding 3/8 of an inch in length.
 - B. Plastic (not tillable) if the segments are longer than 3/8 of an inch before breaking.
4. This Procedure is to be used to aid in determining when soil conditions are dry enough for construction activities to proceed.
5. Once the soil consistency has been determined to be of adequate dryness, the plasticity test is not required again until the next precipitation event.