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DATE: May 1, 2013

TO: MAG Specifications and Details Committee

FROM: Jim Badowich, Avondale Representative, Vice Chair

SUBJECT: New Case 13-16:
Revision to Section 602; *Encasement of Water or Sewer Pipe by Jacking or Tunneling Operation*

PURPOSE: Update and revise specification to current industry methods and technology including revision to the specification title.

SECTION 602

Below is the original MAG 602-1967???**ENCASEMENT OF WATER OR SEWER PIPE BY JACKING OR TUNNELING OPERATION****602.1 DESCRIPTION:**

The Contractor shall furnish all labor, material and equipment as required to perform the jacking or tunneling operation in accordance with the plans and specifications.

In the performance of the work, the Contractor shall comply with the lawful requirements of the affected Contracting Agencies, owners of public utilities and any other facilities which might be endangered by jacking or tunneling operations.

602.2 GENERAL:

Unless otherwise provided for by the Contracting or Permitting Agency the Contractor shall be responsible for determining the required thickness of the steel liner plate or steel casing in accordance with the manufacturer's recommendations.

The inside diameter of the steel liner plate or steel casing shall be a minimum of 12 inches larger than the largest outside diameter of the carrier pipe or the size indicated on the plans, whichever is greater. No part of the plates or flanges shall be allowed to extend inside this net diameter. It shall be the responsibility of the Contractor to increase such dimension where necessary to provide placement room for pipe bells or to provide adequate space for grout placement.

The tolerances allowed for the alignment and grade of carrier pipe shall be the same as if it was being installed in a trench (Sections [610](#), [615](#) and [618](#)).

The approach trench for jacking or tunneling operation shall be shored to safeguard existing sub-structure and surface improvements and to protect against ground movement in the vicinity of the jack supports or tunnel portal.

602.3 JACKING OPERATION:

Before starting operations, the Contractor shall submit in accordance with Subsection [105.2](#), detailed shop drawing of the jacking pit bracing, the casing, the jacking head, the carrier pipe installation method and the bracing to prevent carrier pipe flotation and shifting.

The casing shall consist of welded steel pipe (ASTM A283 Grade C). Shop and field joints shall be butt weld. Fabrication and welding shall be in accordance with AWWA C-200. Weld or hydrostatic testing is not required.

The leading edge of the casing shall be equipped with a steel jacking head, securely anchored to prevent any wobble or alignment variation during the jacking operation. Excavation shall not be made in advance of the jacking head and every effort shall be made to avoid any loss of earth outside of the jacking head. Excavated material shall be removed from the casing as excavation progresses and accumulation of material within the casing shall not be permitted.

Once the jacking operation has started, it shall be continued around the clock until the specified limits have been reached.

On steel casing 36 inches or larger (I.D.), grout connections shall be provided at a maximum spacing of 10 feet. Upon completion of the jacking operation, all voids around the outside face of the steel casing shall be filled by grouting. Grouting equipment and material shall be on the job site before the jacking operations are completed so that grouting may be started immediately. Grout shall be placed by means of pumps capable of pressures up to 100 psi unless otherwise approved by the Engineer. Grouting pressure shall be controlled to approximately 10 psi so as to avoid movement of the ground around the steel casing. After grouting has been completed, the grouting connections will be closed with threaded steel plugs.

Steel casing smaller than 36 inches (I.D.) will not require outside grouting unless caving or earth movement occurs.

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602.4 TUNNELING OPERATIONS:

Before starting operations, the Contractor shall submit, in accordance with Subsection [105.2](#), detailed shop drawing of the steel liner plate, method of installing the steel liner plates, tunnel dimensions, method of backpacking any cave-ins or overexcavation, carrier pipe installation method, and the bracing to prevent carrier pipe shifting and flotation.

Only steel liner plates will be used for tunnel support. All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be fabricated for erection inside the tunnel. Grout connections will be provided on the liner plates at a maximum distance of 10 feet. The entire periphery of the tunnel will be lined allowing no gaps between the liner plates. Excavation of the tunnel section shall be restricted to the least clearance required to permit erection of the liner plate. Every effort will be made to prevent any loss of ground and the Contractor shall perform the grouting operation at intervals not to exceed three rings of the liner plate. Grout shall be placed by means of pumps capable of pressures up to 100 psi. The placement pressure shall not, normally, exceed 10 psi to avoid deformation of the liner plate or the ground. After grouting has been completed, the grout connection will be closed with threaded steel plugs.

602.5 DEWATERING:

All water encountered during the jacking or tunneling operation shall be disposed of by the Contractor in such a manner as will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering will be considered incidental to the work and no additional payment will be made.

602.6 CARRIER PIPE PLACEMENT:

Carrier pipe, larger than 24 inches (I.D.), shall be placed using pipes or rails for alignment and grade. Carrier pipe, 24 inches I.D. or less, may be placed using pipes, rails or wooden skids, at the Contractor's option. In either case, it shall be the Contractor's responsibility to obtain the required alignment and grade for the carrier pipe and to ensure that the carrier pipe does not draw or rest on the casing or liner plate.

After the carrier pipe has been placed and securely blocked to prevent shifting or flotation, the entire annular space shall be completely filled with grout.

If the Contractor is not ready to place the carrier pipe immediately following completion of the jacking or tunneling operation, the ends shall be protected with temporary bulkheads. The approach trench shall be backfilled in accordance with Sections [601](#) and [336](#).

After completion of the grouting operation, the Contractor shall remove all loose and disturbed material in the approach trench and backfill the trench in accordance with Sections [601](#) and [336](#).

602.7 MEASUREMENT AND PAYMENT:

Measurement for this work shall be at the ground surface and shall be the number of horizontal linear feet of ground surface undisturbed by the cut and cover construction on the ends of the steel casing or tunnel liner operation. Payment compensation for furnishing all labor, material, tools, and equipment required for the successful completion of the jacking or tunneling operation, including carrier pipe placement, in accordance with this Section.

- *End of Section* -

SECTION 602

This is the first revision submitted to the subcommittee March 3, 2013

TRENCHLESS INSTALLATION OF WATER OR SEWER PIPE ENCASEMENT OF WATER OR SEWER PIPE BY OR TUNNELING OPERATION

602.1 DESCRIPTION:

The Contractor shall furnish all labor, material and equipment as required to perform the ~~jacking or tunneling~~ **trenchless** operation in accordance with the plans and specifications **using horizontal earth auger boring, hand tunneling, pipe ramming or other trenchless method.**

In the performance of the work, the Contractor shall comply with the lawful requirements of the affected Contracting Agencies, owners of public utilities and any other facilities which might be endangered by ~~jacking or tunneling~~ **trenchless** operations.

602.2 GENERAL:

Unless otherwise provided for by the Contracting or Permitting Agency the **minimum wall thickness for steel casing shall be 3/8", or greater as determined by casing size, soil conditions and installation method.** ~~Contractor shall be responsible for determining the required thickness of the steel liner plate or steel casing in accordance with the manufacturer's recommendations.~~

~~The inside diameter of the steel liner plate or steel casing shall be a minimum of 12 inches larger than the largest outside diameter of the carrier pipe or the size indicated on the plans, whichever is greater. No part of the plates or flanges shall be allowed to extend inside this net diameter. It shall be the responsibility of the Contractor to increase such dimension where necessary to provide placement room for pipe bells or to provide adequate space for grout placement.~~

The tolerances allowed for the alignment and grade of carrier pipe shall be the same as if it was being installed in a trench (Sections [610](#), [615](#) and [618](#)).

The ~~approach trench~~ **bore & reception pits** for ~~jacking or tunneling~~ **the trenchless** operation shall be shored to safeguard existing sub-structure and surface improvements and to protect against ground movement. ~~in the vicinity of the jack supports or tunnel portal.~~

602.3 TRENCHLESS JACKING OPERATION:

Before starting operations, the Contractor shall submit in accordance with Subsection [105.2](#), detailed shop drawing of the ~~jacking bore pit shoring, the casing, the jacking head, and the carrier pipe installation method. and the bracing to prevent carrier pipe flotation and shifting.~~

The casing shall consist of welded steel ~~pipe~~ **plate rolled into a can** confirming to (ASTM A283 Grade C or ASTM A252). Shop and field joints shall be butt weld. Fabrication and welding shall be in accordance with AWWA C-200. Weld or hydrostatic testing is not required.

~~The leading edge of the casing shall be equipped with a steel jacking head, securely anchored to prevent any wobble or alignment variation during the jacking operation. Excavation shall not be made in advance of the jacking head and every effort shall be made to avoid any loss of earth outside of the jacking head. Excavated material shall be removed from the casing as excavation progresses and accumulation of material within the casing shall not be permitted.~~

~~Once the jacking operation has started, it shall be continued around the clock until the specified limits have been reached.~~

It shall be the responsibility of the contractor, considering geotechnical conditions and project specific conditions, to determine if the project shall run continuously around the clock until the specified limits have been reached.

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On steel casing 36 inches or larger (I.D.), grout connections shall be provided at a maximum spacing of 10 feet. Upon completion of the jacking operation, all voids around the outside face of the steel casing shall be filled by grouting. Grouting equipment and material shall be on the job site before the jacking operations are completed so that grouting may be started immediately. Grout shall be placed by means of pumps capable of pressures up to 100 psi unless otherwise approved by the Engineer. Grouting pressure shall be controlled to approximately 10 psi so as to avoid movement of the ground around the steel casing. After grouting has been completed, the grouting connections will be closed with threaded steel plugs.

On steel casing 36 inches or larger grout connections shall be provided at a maximum spacing of every 20 feet located at 12 o'clock in the steel casing. Upon completion of the boring operation, the contractor shall inspect each grout hole to determine if grouting is required. Any void greater than 2" will require the boring contractor to attempt grouting. After grouting the grout holes will be closed with a threaded steel plug.

Steel casing smaller than 36 inches (O.D.) will not require outside grouting unless caving or earth movement occurs

602.4 TUNNELING OPERATIONS:

Before starting operations, the Contractor shall submit, in accordance with Subsection [105.2](#), detailed shop drawing of the steel liner plate ~~or steel casing~~, method of installing the steel liner plates ~~or steel casings~~, tunnel dimensions, method of backpacing any cave ins or over excavation, carrier pipe installation method, and the bracing to prevent carrier pipe shifting and flotation.

Only steel liner plates, ~~steel casings or rib & lagging~~ will be used for tunnel support. All plates shall be punched for bolting on both longitudinal and circumferential seams or joints and shall be fabricated for erection inside the tunnel. Grout connections will be provided on the liner plates at a maximum distance of 10 feet. The entire periphery of the tunnel will be lined allowing no gaps between the liner plates. Excavation of the tunnel section shall be restricted to the least clearance required, to permit erection of the liner plate. Every effort will be made to prevent any loss of ground and the Contractor shall perform the grouting operation at intervals not to exceed three rings of the liner plate ~~or rib & lagging~~. ~~For steel casing grouting will commence after the casing has been completely installed.~~ Grout shall be placed by means of pumps capable of pressures up to 100 psi. The placement pressure shall not, normally, exceed 10 psi to avoid deformation of the liner plate or the ground. After grouting has been completed, the grout connection will be closed with threaded steel plugs.

602.5 DEWATERING:

All water encountered during the ~~jacking or tunneling~~ ~~trenchless~~ operation shall be disposed of by the Contractor in such a manner as will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering will be considered incidental to the work and no additional payment will be made.

602.6 CARRIER PIPE PLACEMENT:

Carrier pipe, larger than 24 inches (I.D.), shall be placed using pipes or rails for alignment and grade. Carrier pipe, 24 inches I.D. or less, may be placed using pipes, rails or wooden skids, at the Contractor's option. In either case, it shall be the Contractor's responsibility to obtain the required alignment and grade for the carrier pipe and to ensure that the carrier pipe does not draw or rest on the casing or liner plate.

Pressurized carrier pipes, ie water, gas, shall be placed using casing spacers, wood skids or 1" -2" pipes for rails.

Gravity carrier pipes, ie sewer, storm drain, shall be placed using wood skids or 1"-2" pipes for rails.

In either case it shall be the Contractor's responsibility to obtain the required line and grade for the carrier pipe and to ensure that the carrier pipe does not draw or rest on the casing.

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The annular space between the casing and carrier line shall be left empty, should the annular space need to be filled 5/16" to 3/8" pea gravel shall be used to fill the annular space.

Bulkheads consisting of brick and mortar or concrete, shall be constructed on either end of the casing, bulkheads shall be a minimum of 8" thick.

~~After the carrier pipe has been placed and securely blocked to prevent shifting or flotation, the entire annular space shall be completely filled with grout.~~

If the Contractor is not ready to place the carrier pipe immediately following completion of the jacking or tunneling operation, the ends shall be protected with temporary bulkheads. The ~~approach trench~~ bore pits shall be backfilled in accordance with Sections [601](#) and [336](#).

After ~~completion of~~ completing the grouting operation, the Contractor shall remove all loose and disturbed material in the ~~approach trench~~ bore pits and backfill the ~~trench~~ pits in accordance with Sections [601](#) and [336](#).

602.7 MEASUREMENT AND PAYMENT:

Measurement for this work shall be at the ground surface and shall be the number of horizontal linear feet **from the end of the casing in the bore pit to the end of the casing in the reception pit** ~~of ground surface undisturbed by the cut and cover construction on the ends of the steel casing or tunnel liner operation.~~ Payment compensation for furnishing all labor, material, tools, and equipment required for the successful completion of the ~~jacking or tunneling~~ trenchless operation, including carrier pipe placement, in accordance with this Section.

- End of Section -

SECTION 602

2nd revision of MAG 602- preliminary final draft March 3, 2013

TRENCHLESS INSTALLATION OF WATER OR SEWER PIPE

602.1 DESCRIPTION:

The Contractor shall furnish all labor, material and equipment as required to perform the **trenchless** operation in accordance with the plans and specifications **using horizontal earth auger boring, hand tunneling, pipe ramming or other trenchless method.**

In the performance of the work, the Contractor shall comply with the lawful requirements of the affected Contracting Agencies, owners of public utilities and any other facilities which might be endangered by **trenchless** operations.

602.2 GENERAL:

Unless otherwise provided for by the Contracting or Permitting Agency the **minimum wall thickness for steel casing shall be 3/8-inch, or greater as determined by casing size, soil conditions and installation method.**

The tolerances allowed for the alignment and grade of carrier pipe shall be the same as if it was being installed in a trench (Sections [610](#), [615](#) and [618](#)).

The **bore & reception pits** for the **trenchless** operation shall be shored to safeguard existing sub-structure and surface improvements and to protect against ground movement.

602.3 TRENCHLESS OPERATION:

Before starting operations, the Contractor shall submit in accordance with Subsection [105.2](#), detailed shop drawing of the **bore pit shoring**, the casing, **and** the carrier pipe installation method.

The casing shall consist of welded steel **plate rolled into a can conforming to** (ASTM A283 Grade C or ASTM A252). Shop and field joints shall be butt weld. Fabrication and welding shall be in accordance with AWWA C-200. Weld or hydrostatic testing is not required.

It shall be the responsibility of the contractor, considering geotechnical conditions and project specific conditions, to determine if the project shall run continuously around the clock until the specified limits have been reached.

On steel casing 36 inches or larger grout connections shall be provided at a maximum spacing of every 20 feet located at 12 o'clock in the steel casing. Upon completion of the boring operation, the contractor shall inspect each grout hole to determine if grouting is required. Any void greater than 2 inches will require the boring contractor to attempt grouting. After grouting the grout holes will be closed with a threaded plug.

Steel casing smaller than 36 inches (O.D.) will not require outside grouting unless caving or earth movement occurs

602.4 DEWATERING:

All water encountered during the **trenchless** operation shall be disposed of by the Contractor in such a manner as will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering will be considered incidental to the work and no additional payment will be made.

602.5 CARRIER PIPE PLACEMENT:

Pressurized carrier pipes, (i.e. water, gas) shall be placed using casing spacers, wood skids or 1-inch to 2-inch steel pipes for rails.

SECTION 602

Gravity carrier pipes, (i.e. sewer, storm drain) shall be placed using wood skids or 1-inch to 2-inch steel pipes for rails.

In either case it shall be the Contractor's responsibility to obtain the required line and grade for the carrier pipe and to ensure that the carrier pipe does not draw or rest on the casing.

The annular space between the casing and carrier line shall be left empty, should the annular space need to be filled 5/16-inch to 3/8-inch pea gravel shall be used to fill the annular space.

Bulkheads consisting of brick and mortar or concrete, shall be constructed on either end of the casing, bulkheads shall be a minimum of 8 inches thick.

If the Contractor is not ready to place the carrier pipe immediately following completion of the jacking or tunneling operation, the ends shall be protected with temporary bulkheads. The bore pits shall be backfilled in accordance with Sections [601](#) and [336](#).

After completing the operation, the Contractor shall remove all loose and disturbed material in the bore pits and backfill the pits in accordance with Sections [601](#) and [336](#).

602.6 MEASUREMENT AND PAYMENT:

Measurement for this work shall be at the ground surface and shall be the number of horizontal linear feet from the end of casing in the bore pit to the end of casing in the reception pit. Payment compensation for furnishing all labor, material, tools, and equipment required for the successful completion of the trenchless operation, including carrier pipe placement, in accordance with this Section.

- End of Section -

SECTION 602

3rd revision of MAG 602-Preliminary Final Draft-May 22, 2013 TRENCHLESS INSTALLATION OF ~~WATER OR SEWER PIPE~~ STEEL CASING

602.1 DESCRIPTION:

The Contractor shall furnish all labor, material and equipment as required performing the trenchless operation for installing steel casing for water or sewer lines and dry utilities in accordance with the plans and specifications using horizontal earth auger boring, hand tunneling or pipe ramming. ~~or other trenchless method.~~

In the performance of the work, the Contractor shall comply with the lawful requirements of the affected Contracting Agencies, owners of public utilities and any other facilities which might be endangered by trenchless operations.

602.2 GENERAL:

Unless otherwise provided for by the Contracting or Permitting Agency the minimum wall thickness for steel casing shall be 3/8-inch, or greater as determined by casing size, soil conditions and installation method.

The tolerances allowed for the alignment and grade of carrier pipe shall be the same as if it was being installed in a trench (Sections [610](#), [615](#) and [618](#)).

The bore & reception pits for the trenchless operation shall be shored to safeguard existing sub-structure and surface improvements and to protect against ground movement.

602.3 TRENCHLESS OPERATION:

Before starting operations, the Contractor shall submit in accordance with Subsection [105.2](#), detailed shop drawing of the bore pit shoring, the casing, and the carrier pipe installation method.

The casing shall consist of welded steel plate rolled into a can conforming to (ASTM A283 Grade C or ASTM A252). Shop and field joints shall be butt weld. Fabrication and welding shall be in accordance with AWWA C-200. Weld or hydrostatic testing is not required.

It shall be the responsibility of the contractor, considering geotechnical conditions and project specific conditions, to determine if the project shall run continuously around the clock until the specified limits have been reached.

On steel casing 36 inches or larger grout connections shall be provided at a maximum spacing of every 20 feet located at 12 o'clock in the steel casing. Upon completion of the boring operation, the contractor shall inspect each grout hole to determine if grouting is required. Any void greater than 2 inches will require the boring contractor to attempt grouting. After grouting the grout holes will be closed with a threaded plug.

Steel casing smaller than 36 inches (O.D.) will not require outside grouting unless caving or earth movement occurs

602.4 DEWATERING:

All water encountered during the trenchless operation shall be disposed of by the Contractor in such a manner as will not damage public or private property or create a nuisance or health problem. The cost of furnishing pumps, pipes and equipment for dewatering will be considered incidental to the work and no additional payment will be made.

SECTION 602

602.5 CARRIER PIPE PLACEMENT:

Pressurized carrier pipes, (i.e. water, gas) shall be placed using casing spacers, wood skids or 1-inch to 2-inch steel pipes for rails.

Gravity carrier pipes, (i.e. sewer, storm drain) shall be placed using wood skids or 1-inch to 2-inch steel pipes for rails.

In either case it shall be the Contractor's responsibility to obtain the required line and grade for the carrier pipe and to ensure that the carrier pipe does not draw or rest on the casing.

The annular space between the casing and carrier line shall be left empty, should the annular space need to be filled 5/16-inch to 3/8-inch pea gravel shall be used to fill the annular space.

Bulkheads consisting of brick and mortar or concrete, shall be constructed on either end of the casing, bulkheads shall be a minimum of 8 inches thick.

PVC conduits for dry utilities, (i.e. communications, fiber, electric) shall be placed using non-metallic PVC casing spacers.

Grout may be used to fill the annular space when PVC electrical conduits are the carrier line.

~~If the Contractor is not ready to place the carrier pipe immediately following completion of the jacking or tunneling operation, the ends shall be protected with temporary bulkheads. The bore pits shall be backfilled in accordance with Sections 601 and 336.~~

After completing the operation, the Contractor shall remove all loose and disturbed material in the bore pits and backfill the pits in accordance with Sections 601 and 336.

602.6 MEASUREMENT AND PAYMENT:

Measurement for this work shall be at the ground surface and shall be the number of horizontal linear feet from the end of casing in the bore pit to the end of casing in the reception pit. Payment compensation for furnishing all labor, material, tools, and equipment required for the successful completion of the trenchless operation, including carrier pipe placement, in accordance with this Section.

- *End of Section* -