

ONSITE WASTEWATER SYSTEM CONSTRUCTION INSPECTIONS FOR LOCAL HEALTH INSPECTORS

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3 Key Aspects to Achieve Best Practices for an Onsite Wastewater System

To best protect public health and the environment, an onsite system needs to be properly:

- Designed
- Built**
- Maintained

What does Title 5 say about Onsite System Construction?

- 15.019 - 15.030 - Procedures and permits
- 15.021 - 15.255 - Materials and construction methodology
- 15.353 – 15.354 - Emergency repairs

Inspections in Title 5

In theory, much of the construction oversight in Title 5 is supposed to be the responsibility of the designer.

In Title 5 there are also required construction oversight tasks of the local health department.....

and there are many other tasks which are prudent for a health department to implement that are not “required”

Inspections in Title 5

- ❑ Components are not to be backfilled until an inspection has been performed by local health inspector and then permission granted to backfill. The final inspection of the system shall be conducted by the Approving Authority, the system installer and the Designer
- ❑ “The Designer shall inspect the construction after the initial excavation, prior to backfilling, and during backfilling”
- ❑ The approving authority shall make “sufficient inspections” to determine that the work is in compliance with Title 5, the approved design plans and local requirements

What are Some Problems with Construction Oversight Today?

- ❑ Unclear responsibility of the local health department
- ❑ Tricky to implement
- ❑ Not commonly within comfort zone of health inspectors
- ❑ Identifying problems and causing corrections can be difficult
- ❑ Little guidance is provided by DEP

- ❑ Improper oversight can lead to short-term or long-term ramifications for public health or the environment



What is the Minimum Construction Inspection Activity Required of a Local Health Department?

Summary –

Title 5 says the local health inspector is responsible for:

- The paperwork associated with construction (pre- and post-)
- Being present at the final construction inspection
- Performing “sufficient inspections” to determine if the construction is in compliance with Title 5 and the design plans

What is the Minimum Construction Inspection Activity Required of a Local Health Department?

- Permit System Installers, suspend or revoke permits if warranted
- Review Applications for a Disposal System Construction Permit (DSCP) along with accompanying design plans and materials, approve or deny
- Issue DSCP
- Void DSCP if work not completed within 3 years, or if conditions are found to be different than on design plan

What is the Minimum Construction Inspection Activity Required of a Local Health Department?

- Make “sufficient inspections” to determine if the work is in compliance with Title 5 and the design plan
- Perform a Final Construction Inspection (with installer and designer)
- Issue Certificate of Compliance, provide copy to Building Inspector
- Provide onsite system owner with DEP’s O&M Guide, or info on where to obtain
- Maintain a file regarding each onsite system

What is the Minimum Construction Inspection Activity Required of the Onsite System Designer?

- Inspect construction
 - After initial excavation
 - Of impervious barrier (if proposed)
 - Prior to backfilling
 - During backfilling
 - Final inspection (with installer and local health department)
- Certify in writing that system was constructed in compliance with Title 5 and the design plans
- Certify in writing that any changes to the approved plans have been reflected on submitted as-builts
- Provide as-built, if any items changed from proposed
- Provide as built of barrier, if used, which has certification of designer that the barrier was built per plan

What is the Minimum Construction Inspection Activity Required of the Onsite System Installer?

- Obtain a Disposal System Installers Permit
- Obtain a Disposal Systems Construction Permit (DSCP) before commencing work on an onsite system
- Complete construction of onsite system within 3 years of issuance of DSCP
- Certify in writing that system was constructed in compliance with Title 5 and the design plans

What are Some Larger Problems with Construction Inspections?

In Title 5:

- “Approved Plan”
- Sand fill testing is not clear
- Designer inspection requirements are not well written
- Health Inspector inspection requirements are not well written

What are Some Larger Problems with Construction Inspections?

In practice:

- Lack of DEP training and staff support
- Title 5 is complex to implement
- Forms do not ask installer or designer to certify when needed
- Designers do not inspect as written in Title 5
- Onsite wastewater system construction is commonly within comfort zone of health inspectors
- Identifying problems and causing corrections can be difficult

Procedures and permits – Installer permit

- Local health departments are to permit onsite wastewater installation contractors to work in their jurisdiction
- Permit is for an individual, not a company
- Only issue permit after “demonstrated knowledge of and experience with construction.....of systems”
- Permit valid for up to 2 years
- Permit can be suspended or revoked for failing to comply with Title 5, for not providing a Certificate of Compliance, or for providing a Certificate of Compliance that is in violation of the construction permit

Note – there is no DEP form for this application or for the permit

Procedures and permits - DSCP

Disposal System Construction Permit (DSCP) is the key regulatory control in Title 5

No regulatory citation for an “approved plan” in Title 5

A DSCP which references a plan of a particular date is the closest thing in Title 5 to an approved plan

DSCP Form 1A



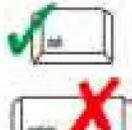
Commonwealth of Massachusetts
City/Town of
**Application for Disposal System
Construction Permit**
Form 1A

Number _____
\$ _____
Fee _____

DEP has provided this form for use by local Boards of Health if they choose to do so. Before using the form, check with your local Board of Health to make sure that they will accept it.

A. Facility Information

Important:
When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



Application is hereby made for a permit to: Construct a new on-site sewage disposal system
 Repair or replace an existing on-site sewage disposal system
 Repair or replace an existing system component

1. Location of Facility:

Address or Lot # _____
City/Town _____ State _____ Zip Code _____

DSCP Form 1A

7. Plan:

Date of Original

Number of Sheets

Revision Date

Title of Plan

DSCP Form 1A



Commonwealth of Massachusetts
City/Town of _____
**Application for Disposal System
Construction Permit**
Form 1A

Number _____

\$ _____
Fee

B. Agreement

The undersigned agrees to ensure the construction and maintenance of the aforescribed on-site sewage disposal system in accordance with the provisions of Title 5 of the Environmental Code and not to place the system in operation until a Certificate of Compliance has been issued by this Board of Health.

Signature _____

Date _____

Application Approved By:

Name _____

Date _____

Application **Disapproved** for the following reasons:

DSCP Form 2A

Commonwealth of Massachusetts
City/Town of _____
Disposal System Construction Permit
Form 2A

Number _____

DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

Permission is hereby granted to:

Name _____

Name of Company _____

Address _____

City/Town _____

State _____

Zip Code _____

to perform the following work on an on-site sewage disposal system:

- Construction
- Repair or replacement
- Repair or replacement of system components

Facility Address _____

City/Town _____

State _____

Zip Code _____

Owner _____

Telephone Number _____

The work to be performed is further described in the Application for Disposal System Construction Permit. The applicant recognizes his/her duty to comply with Title 5 and the following local provisions or special conditions:

Procedures and permits - DSCP

- DSCP must be on a form approved by the DEP
- No work is to occur unless a DSCP has been issued
- If site conditions are different than on design plan then the DSCP is void and work shall stop
- Work authorized by a DSCP must be completed within 3 years, with a possible 1 year extension

Procedures and permits – C of C

A Certificate of Compliance form is to be signed within 30 days of the Final Inspection by the Installer and Designer to certify that the system has been constructed in compliance with Title 5, the approved design plans, and all local requirements and that any changes are reflected on an as-built.

If no changes to locations or elevations then an as-built is not required to be provided and only a diagram showing distances to the various components needs to be provided

If an as-built is needed then it must comply with the plan requirements at 15.220 and show the locations and elevations of the various system components

No sewage is to be discharged to the onsite system until a C of C has been issued

A copy of the C of C is to be provided to the local building inspector

No person may apply for a Certificate of Occupancy without first having obtained a C of C for the onsite wastewater system

C of C Form 3

Commonwealth of Massachusetts
City/Town of _____
Certificate of Compliance
Form 3

DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

This is to Certify that the following work on an On-Site Sewage Disposal System

- Construction of a new system
- Repair or replacement of an existing system
- Repair or replacement of an existing system component

Has been done in accordance with Title 5 and the Disposal System Construction Permit (DSCP):

DSCP Number _____ DSCP Date _____

Facility Owner _____

Street Address or Lot # _____

City/Town _____ State _____ Zip Code _____

Designer Information:

Name _____ Name of Company _____

Signature _____ Date _____

Installer Information:

Name _____ Name of Company _____

Signature _____ Date _____

Use of this system is conditioned on compliance with the provisions set forth below:

The issuance of this certificate shall not be construed as a guarantee that the system will function as designed.

Approving Authority _____

Signature _____ Date _____

Procedures and permits - Emergencies

- Pumping of tank or cesspool as often as needed is the preferred solution to an emergency situation
- Can repair or replace a structural component, but not the SAS, if that is the cause of urgent situation
- Installer is to 24 hour notice to local health department, and apply for DSCP within 14 days

Procedures and permits – System Abandonment

- Tank contents to be pumped
- Tank excavated and removed from site or bottom is opened or ruptured and tank filled with sand or other suitable material
- No DSCP needed nor any inspection indicated in Title 5 that needs to occur

Procedures and permits – Recordkeeping

Records are to be kept by local health department for each onsite system, including:

- Designs plan and DSCP
- As-built
- Construction inspection report
- C of C
- Installers permit



How to Best Protect Public Health and the Environment During Onsite System Construction

As envisioned in Title 5, the materials and methods of an onsite wastewater system are supposed to be known by the permitted system installer and are to be overseen by the designer.

Is this really the case? In some instances when there is a top-notch installer and a top-notch designer working at a site construction and construction inspections might be done fully in compliance with Title 5, but how often does that happen?

How to Best Protect Public Health and the Environment During Onsite System Construction

Steps which can be taken by the local health department to raise the standard of onsite wastewater system construction work include:

- ❑ Cull the list of permitted installers to only top-notch persons
- ❑ Notate a list of specific required inspections to be performed by the designer, along with specific signed certifications for them to endorse, and/or
- ❑ Perform inspections above the minimum of a final inspection indicated in Title 5 (“sufficient inspections”) to overcome shortcomings of the installer and/or designer and Title 5

How to Best Protect Public Health and the Environment During Onsite System Construction

Recommended health department inspections:

- Bed bottom
- Tank bottom
- Sand fill collected from at least one location and analyzed for compliance with specifications in Title 5
- Final installation of components, confirmation of proper component selection, examination of construction methodology, and system operation
- Final grade



Forms -

Commonwealth of Massachusetts

City/Town of

Septic System Installation Checklist

DEP has provided this form for use by local Boards of Health if they wish to do so.

A. Applicant Information

Name _____

Address _____

City _____

State _____

Zip Code _____

Disposal System Construction Permit # _____

Map _____

Lot _____

Installer _____

Designer _____

Board of Health Representative _____

Inspection Dates:

Tank:

_____ Date

Leach Area:

_____ Date

Final:

_____ Date

Other:

_____ Date

Forms -

Commonwealth of Massachusetts

City/Town of

Septic System Installation Checklist

B. Application Checklist (cont.)

2. Construction Inspection

a) Building Sewer (310 CMR 15.222)		Approved	N/A	Problem
All waste pipes tied into building sewer	Basement check	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schedule 40 PVC 4" or cast iron	Verify by reading pipe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Minimum slope of 0.01-0.02	Visual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipe laid in continuous straight line	Visual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pipe laid on compact, firm base	Visual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleanouts precede all changes in alignment/grade	Verify by visual/tape	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleanout provided every 100 ft.	Verify by visual/tape	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Backfill material clean	Visual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What is in my mind as I approach an inspection?

- Components
- Craftsmanship
- Compliance



How do I need to be present at an inspection?

- Tank bottom or other non-critical items – the system installer or an employee
- Final Construction Inspection - the system installer (permit holder)

What tools do I bring to an inspection?

- Camera
- Metal tape measure
- Cloth tape measure
- Shovel (long blade)
- Empty bottle
- Survey equipment (or use contractor's)
- Inspection checklist



How Do I Handle Items Which Might Change from Plan

- Effluent filter
- Pump
- Panel
- Benchmark

If Installer changes any of these from what was specified on the design plan, I ask the Designer to investigate and provide a letter saying the change is acceptable (if it is) or else require the Installer to revert to the original on the design plan

Craftsmanship

- ❑ Overall assessment
- ❑ Walk-through from basement to end of soil absorption system
- ❑ Ask about changes

Look for:

- ❑ Sump pump into building sewer
- ❑ Water treatment system discharge into building sewer
- ❑ Laundry system not going elsewhere
- ❑ Building sewer properly bedded, uniform grade
- ❑ Tank penetrations watertight
- ❑ Tank risers watertight



Craftsmanship (continued)

- Tank itself watertight
- Distribution box penetrations are watertight
- Box is watertight
- Distribution is even
- SAS is correct size
- Stone is free from fines
- Sand is acceptable
- Barrier installed (if needed)
- Pipe ends capped or connected, vent if specified



Craftsmanship (continued)



Craftsmanship (continued)

- ❑ Panel on separate circuit
- ❑ Floats and alarm functions
- ❑ Pump functions
- ❑ Manhole sizes
- ❑ Manhole finished height



Components

- ❑ Tank size and rating
- ❑ Effluent filter brand and model
- ❑ Treatment system brand and model
- ❑ Pump brand and model
- ❑ Panel per plan
- ❑ Unique soil absorption system brand and model
- ❑ Sand complies with Title 5
- ❑ Magnetic marking tape



Compliance

- ❑ Size and location is per plan
- ❑ Elevations are per plan
- ❑ Any special conditions complied with



What is stated in Title 5 for Construction Inspections?

Materials and Methodology

All components –

- ❑ Made of corrosion resistant materials
- ❑ No more than 36” below final grade
- ❑ Marked with magnetic marking tape



Materials and Methodology

Building sewer –

- Min 4" diam
- Corrosion resistant material with watertight joints. Protected against root damage
- Cast iron, SCH 40 PVC or equivalent
- Laid on a compacted, firm base
- Slope minimum is 1% (1/8" per foot), 2% preferred (1/4" per foot)
- At junctions of building sewers, change of direction, change of grade or at every 100' there is to be a manhole with cover to grade, sweeping bends or a cleanout with cover to grade
- No trap is allowed
- Building sewer to comply with Plumbing Code



Materials and Methodology

Tanks and distribution boxes -

- ❑ Watertight from manufacturer by specification and warranty, or made watertight
- ❑ Set level on a mechanically compacted level stable base. On native ground this is 6" of aggregate as a base, in fill needs to have proper compaction
- ❑ If in water table shall have counterweights or ballast as needed
- ❑ If have risers, they are not to be more than 6" below final grade



Materials and Methodology

Tanks –

- ❑ Durable material
- ❑ Manhole size minimum 20” for two ends, 8” for center tank opening
- ❑ Septic tank –
 - ❑ One access port to within 6” of final grade if <1,000 gpd flow. Two access ports to within 6” of final grade if >1,000 gpd flow
- ❑ Pump tank –
 - ❑ 20” watertight cover at final grade
- ❑ Manholes at final grade are to be secured against unauthorized access



Materials and Methodology

Tanks –

- ❑ Concrete (pre-cast or poured-in-place), plastic or fiberglass reinforced plastic
- ❑ Concrete tanks embossed to demonstrate compliance with ASTM std C-1227
- ❑ H-20 load bearing if vehicle weight anticipated
- ❑ Minimum cover 9". If greater than 9" then must have risers on all openings



Materials and Methodology

Inside septic tank –

- ❑ Tees schedule 40 PVC
- ❑ Tees located under cleanout manhole, extend 6” above flow line (outlet invert), top of tees 3” below inside lid of tank
- ❑ Inlet tee to extend 10” below flow line (outlet invert)
- ❑ Outlet tee to extend at least 14” below flow line (outlet invert), more if tank is deeper
- ❑ Outlet tee to have gas baffle or DEP-approved effluent filter

Materials and Methodology



Materials and Methodology

Pumps –

- Pump to distribution box and then gravity flow to SAS is pressure dosing. Pump to small diameter piping with no distribution box is pressure distribution
- Pressure dosing to have at least 2” diameter force main
- 1 or 2 dwelling units – single pump. More than 2 dwelling units – dual alternating pumps
- High water alarm located in building served
- High water alarm powered by separate circuit from pumps
- Provide empty storage volume or a permanent generator for emergency use that is automatically switched on
- Tank must have effluent filter

Materials and Methodology

Pumps –



Materials and Methodology

Gravity piping excluding Building Sewer –

- ❑ SDR 35 PVC if no extra weight. If traffic then Schedule 40 PVC is to be used
- ❑ Maximum flow velocity of 2 fps when flowing full

Materials and Methodology

Pressure piping –

- Below frost line, insulated if not, or be self-draining
- Pipe is to withstand pressure and/or vehicle loads
- Thrust blocks as needed to assure functioning of the line

Materials and Methodology

Distribution box –

- Concrete or plastic, minimum sump 6"
- Set level on a mechanically compacted level stable base. On native ground this is 6" of aggregate as a base or on a concrete pad 1.5x the size of the base of the box, in fill needs to have proper compaction
- Inlet tee, baffle or splash plate needed for pumps or 8% slopes
- Distribution lines equal as determined by adding water to the outlet invert. If not equal shall be re-constructed or adjusted using durable and non-deformable material
- One outlet per distribution line
- Lines to be level for first 2' after exiting the box
- Watertight cover. Risers if more than 9" below grade

Materials and Methodology

Distribution box –



Materials and Methodology

Soil absorption system –

- Bottom excavated to a level grade. If removing stones or boulders can fill localized depressions with native material or acceptable fill
- Soil at bottom is not to be compacted or smeared
- Bottom and sides level and scarified
- Stockpiling of materials, or use of vehicles or equipment on SAS area before, during or after construction to be avoided
- Perimeter is to be staked and flagged from before construction until issuance of Certificate of Compliance

Materials and Methodology

Soil absorption system (continued) –

- ❑ Backfill on top shall be 9", plus topsoil. Backfill is to be placed in lifts and compacted to prevent settling. Backfill to have no stones larger than 6" diameter. Tailings or clay may not be used as backfill
- ❑ Final cover shall be stabilized and graded with a minimum slope of 2%
- ❑ Surface drainage not oriented towards soil absorption system
- ❑ At least one 4" perforated pipe inspection port to soil or sand below the stone. To have screw cap and be accessible to within 3" of final grade

Materials and Methodology

Soil absorption system –



Materials and Methodology

Soil absorption system chambers, pits or galleries -

- ❑ One inspection access per unit
- ❑ Two or more pits are to operate in parallel



Materials and Methodology

Soil absorption system aggregate -

- ❑ Base aggregate goes from bottom of SAS to crown of distribution pipe.
- ❑ Base aggregate to be double-washed stone ranging from $\frac{3}{4}$ " to 1.5" diameter and free from iron particles, fines or dust in place
- ❑ On top of base aggregate is a minimum 2" layer of double-washed stone from $\frac{1}{8}$ " to $\frac{1}{2}$ " diameter and free from iron particles, fines or dust in place. To prevent intrusion of fine textured soils into the SAS. Geotextile fabric may be substituted for the 2" layer of stone



Materials and Methodology

Soil absorption system trench or field piping -

- ❑ Made of PVC (sch 40 or SDR 35), ADS or HDPE
- ❑ Sound and tight joints
- ❑ Minimum 3" diameter
- ❑ Orifices 3/8" to 5/8" size, evenly spaced along two rows
- ❑ Ends capped or connected together
- ❑ Venting required if >50' long SAS or under impervious area



Materials and Methodology

Soil absorption system fill installation, if needed –

- ❑ If need to replace topsoil, unsuitable material or other soil to build the system then it is a System in Fill
- ❑ Excavation of unsuitable material is to occur for 5' beyond the SAS. Acceptable fill material is to be placed in that area
- ❑ Fill material is to be clean granular sand, free of organic matter. Can be on-site or imported material. Must not have any stones larger than 2"
- ❑ The bottom surface of the SAS is to be scarified and relatively dry prior to installation of fill material. Dewatering is to occur if groundwater is above the elevation of the bottom of the excavation
- ❑ Fill material is not to be placed during rain or snow storms
- ❑ Fill material is to be stockpiled at the edge of the excavation and then filled in gradually

Materials and Methodology

Soil absorption system fill testing, if fill material is needed –

- ❑ A sieve analysis of a representative sample shall be performed
- ❑ No more than 45% by weight may be retained on #4 sieve
- ❑ A plot of the #4, 50, 100 and 200 sieve results is to fall within the lines on the graph in Title 5
- ❑ If required by local health inspector at a single family house SAS installation, a minimum of one representative sample of the in-situ fill material is to be collected
- ❑ Systems over 2,000 gpd are to have “one soil test per pit per removal day”



Materials and Methodology

Soil absorption system mound, if needed –

- ❑ If it is a system in fill that is higher than natural grade to maintain the separation to ESHGW then it is a Mounded System
- ❑ Side slopes of a Mounded System shall not be steeper than 3:1 (horiz:vert)
- ❑ Toe of slope is to be 5' from a property line or a swale or other drainage mechanism installed to direct runoff from adjacent property



Materials and Methodology

Soil absorption system barrier, if used –

- Top of barrier to be at top of peastone or geotextile fabric
- Recommend 10' from barrier to SAS
- Designer to supervise construction
- Designer to prepare as-built
- Designer to certify on as-built that barrier was properly constructed before issuance of a C of C

Materials and Methodology

Soil absorption system venting, if needed –

- Same diameter as distribution piping
- Prevent animal and precipitation entry
- Backfilled tightly
- Located outside of driving area
- Durable and non-corrosive material

Questions?

Daniel Ottenheimer, R.S., P.E.