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**SPECIFICATIONS**

**FOR**

**ENGINE HOUSE, BOILER HOUSE & STACK**

**FOR THE**

**ROXBOROUGH WATER WORKS,**

**PHILADELPHIA.**

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**HENRY P. M. BIRKINBINE,**

**CHIEF ENGINEER.**

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**PHILADELPHIA:**

**WILLIAM F. GEDDES, PRINTER, 320 CHESTNUT STREET.**

**1866.**

# SPECIFICATIONS

## FOR ERECTING AN ENGINE HOUSE, BOILER HOUSE AND STACK, FOR THE ROXBOROUGH WATER WORKS.

1 To be done under the direction of the Chief Engineer of the Water Department of Philadelphia, according to the following enumerated drawings, consisting of plans, elevations, sections, and working drawings, designed and prepared at the office of the Water Department, and agreeably to such further drawings and directions, in explanation thereof, as may, hereafter, from time to time, be furnished therefrom :

### GENERAL CONDITIONS.

2. All the work to be done in the best manner, of proper and appropriate material, according to the plans hereinafter cited, and the following specifications ; and every thing necessary to the proper and complete execution of said plans be done and finished, whether the same may be herein specified or not ; and all such necessary work or materials which may not be set forth in these specifications, to be done and materials furnished, in a manner corresponding with the rest of the work, as well and as faithfully as though the same were herein particularly described and provided for.

Manner of  
executing  
the work.

Work and  
materials  
not specified.

3. Every part of the buildings to be executed under the supervision of the Chief Engineer of the Water Department, and be subject to his entire approval ; and in case any omissions, additions or alterations of the plans may be required by him during the progress of the work, the same shall be acceded to by the contractor or contractors, and carried into effect, without in any way violating or vitiating any contract which may have been made for work or material ; and all such omissions, additions or alterations, shall be estimated for, and the value thereof agreed upon and added to, or deducted from the contract, by endorsement upon its back, as the case may be, before going into execution, or no allowance will be made for either party.

Superintendence of  
the work.

Omissions,  
additions  
and alterations.

## DRAWINGS.

## (A) GENERAL VIEW OF BUILDINGS.

4. *Fig. 1.* Elevation of Engine and Boiler Houses, as seen from the P. G. & N. R. R.
5. *Fig. 2.* Elevation of Engine and Boiler Houses and Stack, as viewed from the Schuylkill river.
6. *Fig. 3.* Transverse vertical sections of Engine House, exhibiting water-way, pump-chamber, floor line of building, and framing of roof.
7. *Fig. 4.* Elevation of buildings, as seen from the South-east.
8. *Fig. 5.* Plan of foundations and walls for Engine and Boiler Houses, and foundations for Boilers.

## (B) DETAILS OF ROOFS.

9. *Figs. 1 and 1'* exhibit the framing of the roof for Engine House.
10. *Figs. 2 and 2'*. The framing of the roof and ventilator for Boiler House.
11. *Fig. 3.* Dormer windows for Engine House.
12. *Fig. 4.* Ventilating windows for Boiler House.

## (C) DOORS AND WINDOWS.

13. *Fig. 1.* Door for main entrance to Engine House.
14. *Fig. 2.* Doors for Boiler House.
15. *Fig. 3.* Small door for Boiler House.
16. *Fig. 4.* Door between Boiler and Engine House.
17. *Fig. 5.* Windows for Engine House.
18. *Fig. 6.* Wood cornice for Stack and Engine House.

## (D) CUT STONE AND BRICK WORK.

19. *Fig. 1.* Doors for Boiler House.
20. *Fig. 2.* Main door for Engine House.
21. *Fig. 3.* Windows for Engine House.
22. *Fig. 4.* Corner-stones and Water-table for Engine House.
23. *Fig. 5.* Corbal and Arch stones for principals.
24. *Fig. 6.* Details of corner-stones.
25. *Fig. 7.* Masonry and brick-work of Stack.

26. The figures upon the drawings exhibit the sizes and measurements to be used in constructing the buildings. Measurements.

27. The building will consist of an Engine House, Boiler House and Stack, and be situated upon the property of the City, at Green Tree Run Station, on the Philadelphia, Germantown and Norristown Rail Road, eight and a half miles from the Philadelphia terminus. It will be located between the Schuylkill river and the line of the said rail road, the Engine house being furthest up stream, the Boiler House and Stack following in the order named; the whole to form one building, and to be constructed upon lines laid out by the Chief Engineer. The extreme length and width to be one hundred and twenty-seven feet six inches, and thirty-nine feet respectively. Location.  
  
Size of Building.

#### DIGGING, GRADING, ETC

28. The excavations for putting in the foundations, and all other works of similar nature pertaining to the building, and the necessary embanking and grading will be done by the City of Philadelphia, under the direction of the Chief Engineer. Excavations for foundations.

#### STONE MASONRY.

29. All the stones used in the construction of the building, with the exception of the facings, etc., which are cut and dressed, will be furnished by the Department and delivered at or near the site of the building. Stone furnished.

30. The foundations for the Engine House, Boiler House, Stack and Boilers to be built up to a height of thirteen feet seven inches above a bench stake at the level of the water in Flat Rock Dam. They must all be made of large, selected stones, well bonded together, laid upon their largest faces in mortar, and flushed with the same. The foundations of the Engine House to be thirty inches thick; those of the Boiler House and Boilers twenty-four inches thick; and for the Stack twelve feet six inches square. See *Drawing A, Fig. 5.* Foundations.

31. The water-way and the foundations for the pump and engine will be constructed by this Department. Water-way and Pump foundation.

32. The walls of the Engine and Boiler Houses to be of rubble masonry: the stones to be selected and laid in mortar upon their Rubble masonry.

largest beds, and well bonded together. The exterior to present a fair surface with joints flushed in mortar. The joints raked out to receive the pointing, while the mortar is sufficiently moist for the purpose; the pointing to be made of white mortar, when the work shall become sufficiently dry to admit of it being properly performed.

33. The walls for Engine House to be two feet thick, for twenty-four feet six inches in height, and to be pierced with two doors and six windows. The remaining five feet six inches of wall is eighteen inches thick.

34 The walls for Boiler House to be eighteen inches thick and pierced with three doors.

35. Anchors, bolts and blocks of wood to be inserted in the walls for the purpose of securing the window and door frames, etc., when required by the Chief Engineer; and six cast iron spout pipes four inches in diameter, to be walled in as exhibited in *Fig. 5, Drawing A*.

36. The walls for the stack to be a continuation of its foundations and have the same exterior dimensions, but in the centre of the stack there will be a vertical flue five feet six inches square. The walls will be three feet six inches thick, for the first four feet three inches in height; they are then reduced to a thickness of two feet six inches by a water table having a slope of one to one. These walls continue for twenty-three feet, which is the extent of the stone work of stack.

37. An opening four feet square, walled with brick and covered by a brick arch, to be left at the bottom of the stack, for the flue from the boilers. Blocks of wood to be inserted in the stone work for holding cornice and the roof timbers of Boiler House, as directed by the Chief Engineer.

#### CUT STONE WORK.

38. The windows and door frames (ten in all) to be faced with, and the water tables and quoins made of dressed Berks County sandstone, of the dimension shown in *Drawing D*.

39. A water table to extend entirely around the building, except in the spaces occupied by the doors and stack. Around the Engine House it is twenty-one inches wide, and eleven and a half inches thick, with a chamfer on the top of one and a half inches, and

Anchors,  
Bolts, etc.

Stone Work  
of Stack.

Flue from  
Boiler House

Berks  
county sand-  
stone.

Water table.

projects two inches beyond the line of the rubble masonry. Around the Boiler House it is fifteen inches wide and nine inches thick, with one and a half inch chamfer on the top, and projects one and a half inches beyond the line of the rubble masonry.

40. The corners of the Engine House wall are finished with quoins twenty-four inches by twelve inches by twelve inches, with two faces, dressed and chamfered one inch; to be laid so as to present alternate faces of twenty-four inches and twelve inches, as shown in *Fig. 4, Drawing D.* Quoins.

41. The dressing for the main entrance door of the Engine House to be constructed of quoins twelve by twenty-four inches, laid with the twelve inch and twenty-fourth inch faces alternating and having a chamfer of one inch. The arch and keystones to be made of the sizes exhibited in *Fig. 2, Drawing D.* Main door of Engine House.

42. The dressing for the doors of the Boiler House to be made of *jams* fifteen inches wide, seven and a half inches thick, with the face of fifteen inches exposed, the ends and part of the sides chamfered one inch. The arch and keystones, of the dimensions exhibited in *Fig. 1, Drawing D.* Boiler House doors.

43. The dressing for the windows of the Engine House to consist of a sill six feet four inches long, twelve inches wide and nine inches thick, which projects two inches beyond the line of the rubble masonry. Jamb to be twelve inches wide, seven inches thick and project one inch beyond the line of the masonry at the base and nine inches wide, six inches thick in the centre. The arch stones to be fifteen inches wide and of the dimensions shown in *Fig. 3, Drawing D.* The keystone has a chamfer of one inch, and projects two inches beyond the line of rubble masonry. Windows of Engine House.

44. A granite sill ten feet by fifteen by eight inches, to be furnished for the main door of the Engine House. Door-sill.

### BRICK MASONRY.

45. None but straight hard brick to be used, and they must be laid in lime mortar. Brick.

46. The vertical flue in the stone work of the stack to be lined with a four and a half inch brick wall, placed one and a half inches from the stone work; and all of the arches over the doors and windows turned with brick not less than eighteen inches deep. Flue of Stack lined with brick.

47. The upper portion of the stack is built of brick. The base Brick work of Stack.

measures ten feet six inches square, and the walls are twenty-six inches thick, and are battered in the ratio of one horizontal to one seven-tenth vertical, until the exterior measures eight feet ten inches square.

**Batter.** 48. This batter is hidden by a wooden cornice, which is to be supported upon blocks inserted in the brick wall, as directed by the Chief Engineer.

**Change of Shape.** 49. Where the batter ceases the shape is changed, so that the section of the brick work is an octagon, this change is effected in a distance of six feet, and is continued to the top of the stack.

50. The walls within the distance of six feet above the batter are twenty-two inches thick. For the next twenty feet eighteen inches thick, for the next twenty feet thirteen inches thick, and for the remaining distance twenty-two feet eleven inches, nine inches thick. The exterior dimensions of the stack are reduced at the uniform ratio of twenty-one vertical, to one horizontal, from the top of the batter to the summit of the brick work, which is five feet six inches across and surmounted by a cap of No. 14 Galvanized Iron.

**Cap of stack**

#### WOOD WORK.

**Roof of Engine House.**

51. The Engine House to be covered with a French or hipped roof, to be constructed as follows: see *Drawing B, Fig's 1 and 1'*.

52. Three principals crossing the building transversely joggled into the walls and resting upon the corbals. One to be placed across the centre of the building, and the others fifteen feet on either side of it, measuring from centre to centre. Three purlins to be lain upon these principals and run longitudinally across the building. One of these forms the ridge of the roof, the others are placed twelve feet one and a half inches on either side of it, and extend thirteen feet beyond the line of the out side principals. Diagonal braces extend from either side of the principals to each of the purlins. From the ends of the ridge purlin, two additional purlins extend diagonally towards the corners and are met by corner braces, thus forming the end hip of the roof. Rafters are let into these purlins. The rafters to be close boarded with one inch white pine

**Covering of roof.**

53. The sides of the roof to be covered with slate laid upon paper felting, and the top of the roof with tin laid upon paper felting.

54. The rafters are mortised into a wall plate six by twelve inches, extending around the building.



55. The principals are each constructed of a horizontal main beam of white pine sixteen by eighteen inches by thirty-one feet seven inches, supported upon two white pine uprights sixteen by sixteen inches by fifteen feet ten inches, morticed into it and joggled into the wall: they will be stayed to the beam by means of natural growth oak knees, each bolted to it by means of four one and a half inch bolts two feet eight inches long, and a curved main brace of oak twelve by twelve inches, well joggled, and bolted by two two inches bolts three and four feet long. The main brace to curve on a radius of ten feet three inches, and have a two inch bolt six feet three inches long securing it in the centre. The main beam to be trussed by two white pine timbers twelve by sixteen inches, the upper one cut so as to conform to the roof. The purlins to be of white pine twelve by six inches, the braces from the principals to the purlins six by four inches. The corner braces six by eight inches, the rafters on top of the roof four by eight inches, and on the sides and ends four by six inches, all of white pine

Principals.

Dimensions  
of parts

56. The top and corners of the roof to be protected by white pine sheathing nine inches wide.

Sheathing.

57. A wooden cornice to extend all around the building, projecting two feet from the wall, to be thirteen inches wide and supported on brackets two feet long and fourteen inches deep, placed in pairs, *Fig. 1, Drawing B.*

Cornice.

58. The Boiler House to be covered with a wood and iron truss roof, (see *Fig's 2 and 2', Drawing B.*) to be constructed as follows: Three rafters placed transversely across the building, thirteen feet apart. Upon these rafters, and let into them, purlins extending longitudinally across the building, to be placed twenty-five inches apart, except for the distance between the first rafter and the Engine House wall, where they are omitted for a breadth of twenty feet three inches. Wrought iron tie rods one and one-eighth of an inch diameter and thirty-six feet long, passing through a stirrup on each end with screw and nut, so that they may be drawn and set; to extend transversely across the building connecting the opposite sides of each rafter, seven inches on either side of the centre of the rod wrought iron tie rods seven-eighths of an inch diameter, eleven feet six inches long, are attached, extending to the opposite sides of the rafter, and from the point where these diagonals cross a wrought iron suspension rod, half inch diameter and six feet six inches long, hangs down and supports the tie rod. Cast iron

Boiler House  
roof.

Tie Rods.

strutts four by four inches, by three feet nine inches long, extened from the point where the diagonals meet the tie rod to the rafter.

Ventilator.

59. A ventilator twenty feet three inches by thirteen feet, by three feet eight inches high, is to be constructed over the space where the purlins are omitted; the frame to be made as follows:—A purlin to run along the summit of the roof, and one ten feet three inches on either side of it. Into these are morticed twenty-seven uprights, which are also let into purlins placed upon them; rafters are let into these upper purlins and run transversely across the ventilator.

60. The rear end of the frame work to be boarded over and the sides prepared for windows, see *Fig. 4, Drawing B.*

Covering of roof.

61. The roof of the the Boiler House and ventilator to be close boarded with one inch white pine and slated.

62. The gutters to extend around the building, to be lined with tin and connected with the spout pipes.

Dimensions of parts.

63. Each rafter to be framed of two pieces of white pine timber six by twelve inches; the purlins for roof of three by nine inches, for the ventilator of four by eight inches. The outside upright for ventilator to be four by four inches, and the others three by four inches. The rafters for ventilator roof four by six inches and three

Cornice

by six inches, all of white pine. A wooden cornice and gutter to extend around the boiler house roof, as shown in detail, *Fig. 2.*

Doors.

64. The doors to be arched and pannelled as exhibited by *Fig's 1, 2, 3 and 4, Drawing C.* and each furnished with a safe and secure lock.

Main door of Engine House.

65. The frame for the main entrance door of the Engine House to be twelve feet six inches high, ten feet wide, and fourteen inches deep. The upper portion of the pannelling to be fixed, and the door to be eight feet high, nine feet three inches wide, and swung upon four sets of hinges, *Fig. 1, Drawing C.*

Boiler House doors.

66. The frame for the two doors of the Boiler House to be seven feet six inches high, six feet wide and thirteen inches deep. The doors to be double—seven feet three inches high, five feet six inches wide, and swung upon two sets of hinges *Fig. 2, Drawing C.*

Partition door.

67. The frame for the door between the Engine and Boiler Houses to be seven feet six inches long, three feet wide, and five inches deep. The door to be seven feet four and a half inches high, two feet nine inches wide, and swung on one pair of hinges. *Fig. 4, Drawing C.*

Small door of Boiler House.

68. The frame for the small door of the Boiler House to be six

feet high, two feet six inches wide, and five inches deep. The door to be five feet ten and a half inches high, two feet three inches wide, and swung on one set of hinges.

69. The height of the door frames are measured from the sill to the extrados of the arch.

70. The windows to be made and glazed, as shown in *Drawings* **B** and **C**. Windows.

71. The frame for the windows of the Engine House to be fifteen feet nine inches high—measuring from the sill to the summit of the extrados of the arch—four feet wide and ten inches deep. The sash to be double hung and weighted; the two portions each containing eight lights, sixteen by twenty-one inches. To be seven feet six inches by three feet two inches, and seven feet seven inches by three feet two inches, respectively. *Fig. 5, Drawing C.* Windows of Engine House.

72. The frame for the dormer windows in the roof of the Engine House to be seven feet three and a half inches high—measuring from the top of the roof cornice to the estrados of the arch—four feet eight inches wide and twelve inches deep. They are to be placed perpendicularly, and the space between them and the slope of the roof covered over by an arched roof, tinned, and the sides boarded and slated. The sash to contain four lights, sixteen by sixteen inches, weighted at bottom and hung upon a pivot. A lever projects on the inside of the building, to which a cord is attached. *Fig. 3, Drawing C.* Dormer windows of Engine House.

73. The ventilating windows for the Boiler House are framed into the ventilator; they each contain four lights, twelve by fourteen inches, weighted at the bottom and hung on pivots. A lever projects on the inside of the building, to which a cord is attached. *Figure 4, Drawing C.* Ventilating windows of Boiler House

74. The porch to protect the scales at the door of the Boiler House towards the rail road, to be covered by a roof nine feet three inches by eleven feet six inches, supported on two cast-iron pillars seven feet nine inches long, set upon stones. The roof to be surrounded by a cornice similar to that extending around the Boiler House. Scale Porch.

### PLASTERING.

75. The interior of the stone walls of the Engine House and that portion of the Boiler House walls in front of the boilers to be plastered with two coats, colored, in imitation of granite, and

coarse finished with the float in the best manner, so as to prevent defacement and the condensation of moisture.

### PAINTING, GLAZING, ETC

**Principals to be oiled.** 76. The principals of the Engine House roof to be oiled, and the interior of the roofs of the Engine and Boiler Houses to be covered with a stone colored lime wash. The window sash and frames, and doors and frames to be grained, in imitation of walnut, and varnished. **Roof to be washed.** All the cornices, the galvanized top for stack, the pillars of the scales porch, and the sheathing for roof to be painted with three coats and sanded, in imitation of the dressed stone work. **Cornices.**

**Staging, Scaffolding, etc.** 77. All the staging, scaffolding, and other material (excepting the stone for foundations and rubble masonry,) to be furnished by the contractor or contractors, and the building left clean, and all rubbish and refuse material removed from about it when completed. **Building to be left clean**

**Time of completion.** 78. The building to be so far completed as to be ready for the roof on or before the first day of August, and roofed in on or before the first day of September next; and all the work, as described in the above specifications and accompanying drawings, to be done and finished, and all refuse material removed from, in and around the building, on or before the first of October next.

**Payments.** 79. Payments to be made monthly, as the work progresses, by estimates approved by the Chief Engineer; fifteen per cent of such estimate to be retained until all the provisions of the contract are well and truly performed.

**Forfeit.** 80. Should the completion of the work be delayed beyond the time above specified, then the contractor or contractors shall forfeit to the City of Philadelphia, twenty dollars, (\$20) for each and every day said work shall be delayed beyond the time specified.

HENRY P. M. BIRKINBINE,  
*Chief Engineer*  
 Water Department, Philadelphia.