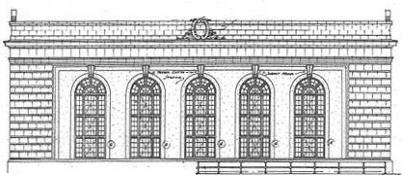


Byrd Park Main Pumping Station Upgrade

1708 Pump House Dr, Richmond, VA 23221

Project Narrative

Purpose of the project

The proposed work is to replace three existing pumps with three new pumping units in order to increase the station's pumping capacity from 30 million gallons a day (mgd) to 46 mgd and associated modifications needed to improve the station overall reliability and redundancy levels.

Description of the work

Pumping units

The station includes three constant speed pumping units which are outdated, and the repair parts are no longer available from the original manufacturer. This results in the pumps having very low reliability and high maintenance costs.

The pumping units also do not have adequate capacity to meet the long-term capacity needs for the Zone 1N supply system.

It is proposed that the three constant speed pumps be replaced by three 23 mgd pumps that have a rated Total Dynamic Head (TDH) of 210 ft.

Electrical system

The Byrd Park Main Pumping Station is supplied with 4.16 kV power from Byrd Park Pumping Station Switchgear SG4 by two 4.16 kV feeders. Switchgear SG4 is supplied from Trafford Pumping Station Switchgear SG2 by two 4.16 kV feeders with supplies from Dominion Energy Feeders 322 (ACCA) and Feeder 399 (Carver).

Each of the two switchgear feeders from Switchgear SG4 from the Byrd Park Main Switchgear SG5 have adequate capacity to handle the existing and proposed Byrd Park Main electrical loads, but Switchgear SG5 does not have an adequate number of feeders available to handle the proposed new Byrd Park Main switches for the electrical feeders which have high arc flash levels, which increase electrical risk levels.

It is proposed that the existing Switchgear SG5 be replaced by a new switchgear to provide adequate feeders to the new 1,250 hp AFD units and to reduce arc flash levels by use of electrical load break 4.16 kV breakers.

The existing 4.16 kV Motor Control Center CC-1, which includes the motor starter equipment for the existing Pump Nos. B1, B2, and B3 does not have adequate capacity to provide the power supply feeders to the three new 4.16 kV, 1,250 hp AFD units.

The proposed new Switchgear SG5 will have a high level of redundancy and reliability because of the dual feeder and bus tie breakers. The Switchgear SG5 breaks would also be the low arc

flash type with control systems that will reduce arc flash levels during switchgear maintenance periods.

The station would be provided with a new 208-volt, 3 PH, 400 A automatic transfer switch that will be used to provide power to new 375-amp, 208 V/120 V, 3 PH Lighting Panel LP-1.

Station Heating and Cooling Systems

The existing gas fired room unit heater has adequate heating capacity to handle the heating needs of the pump room area but not the other areas of the station. Additional gas fired unit heaters are proposed to optimize station heating needs and annual operating costs.

A new supply fan and ductwork will be provided in the pump room to recirculate air and to allow adequate cooling for this area.

Gas fired unit heaters would be used to maintain station temperature above 40° F during cold weather periods when pumping units are not being operated.

During summer the roof mounted exhaust fans would be designed to operate in sequence based on space thermostat settings to allow 30,000 cfm (~10 ACH) single fan, and 60,000 cfm (~20 ACH) both fans operating of outside air into the station. Wall mounted temperature control panel is proposed to operate the fans, provide fan failure alarm indications, and smoke alarm indications. Contacts will be provided at the control panel for remote fan fail alarm indication, and fire alarm.

Dam Sand Sluice Gate Operator

The dam sand gate motor operator is outdated and needs replacement to ensure reliable system operation. The sluice gate and gate frame appear to be in good condition, but the gate shaft should be replaced when the gate operator is replaced to ensure future reliability. The sand gate controls should be connected to the new PLC system to provide improved monitoring and remote operation of the gate.

It is proposed that the existing 36-inch x 42-inch sand sluice gate motor operator be replaced by a new modulating type motor operator. The new operator will also be provided with a new sluice gate shaft and shaft guide.

The gate operator will be provided with both remote manual controls and automatic canal level controls from the new PLC/SCADA system. The automatic canal level controls will be designed to modulate the sand gate to hold canal levels slightly above the dam crest levels to maximize flows through the sand gate, minimizing the accumulation of sand behind the dam.

Station Roof

The station roof is a low slope roof that is overdue for replacement. The roofing membrane is completely loose, and portions of the insulation underneath are exposed to the elements. Rainwater accumulation and vegetation are accumulating and growing on the roof compromising the integrity of the structure. Water leaks are present in the interior compromising the electrical equipment inside and posing a fire risk that can take the pump station out of service. The scope of work includes the immediate replacement of the roof.

Current roof condition

Water leaks through the roof structure.

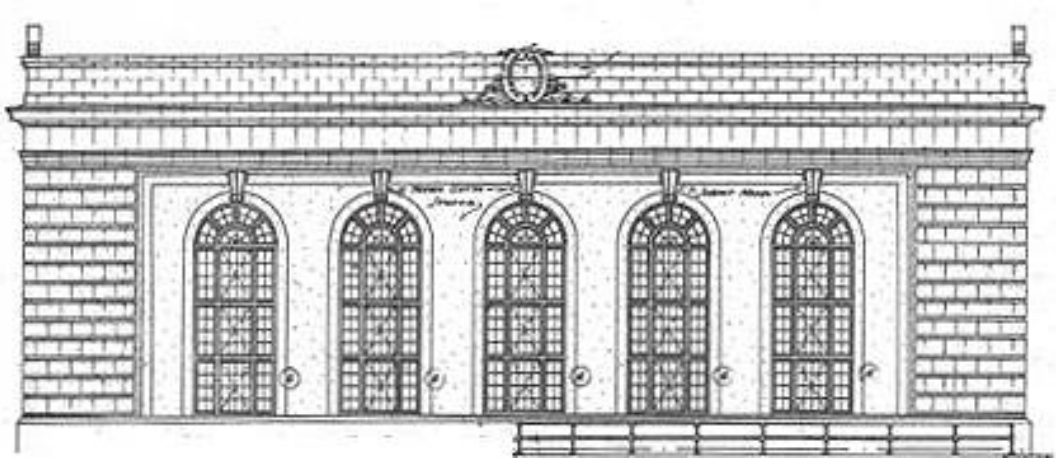
The Pump Station Building

Byrd Park Pump Station Vicinity Map

Byrd Park Pump Station

The building is in an acceptable condition except for the roof and windows. Currently the bottom portion of the windows are covered with metal panels on the exterior to prevent the entrance of critters and water into the building though broken glass panes. Glass panes on the bottom of the four north westerly windows on the north façade have been broken by vandals. Other windows have broken panes, but they are not the result of vandalism but the result of aging, freeze and thaw, accidental hits, etc.

North façade existing condition



Original drawing of the North Facade

Proposed Architectural Interventions to the Pump Station Building

The process and electrical upgrades to the pump station building will not require interventions to the building exterior nor will they alter the interior of the building since equipment is to be replaced in kind or modernized. However, there will be some interventions localized to the windows and to the building roof required to provide the necessary ventilation for the building.

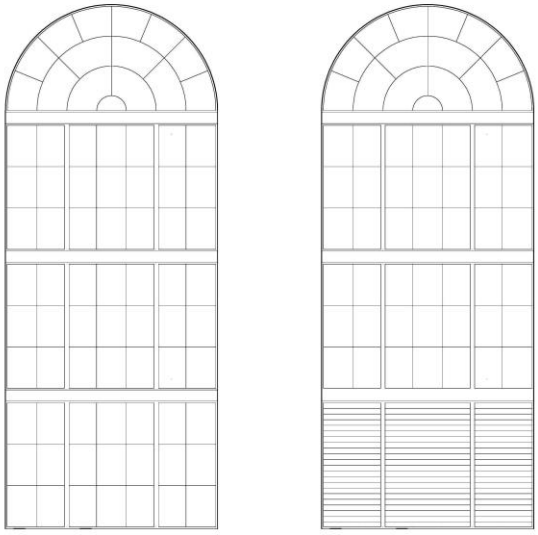
Station Window Improvements

Existing windows are the original windows made of steel. Glazing consists of single pane monolithic opaque glass with panes that have been replaced randomly throughout the years as needed. At some point the windows were provided with a clear color mesh to allow the operable ventilator to be opened but prevent birds and critters into the building.

The bottom portion third module of the windows on the north façade has been covered with a metal panel to prevent extended vandalism damage.

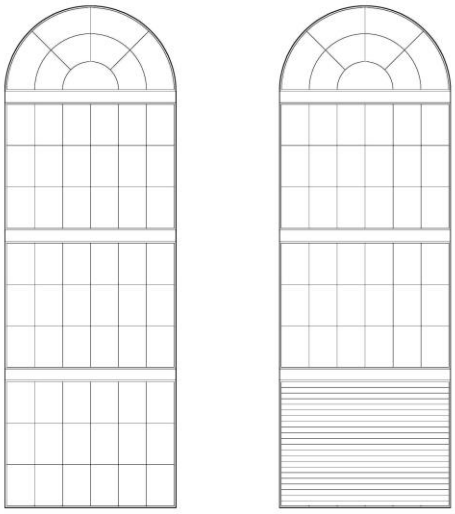
As a result of the improvements, six new louvers are needed to provide the required amount of air by the new air handling units to be installed on the building's roof.

North and south windows



Existing Proposed

East windows



Existing Proposed

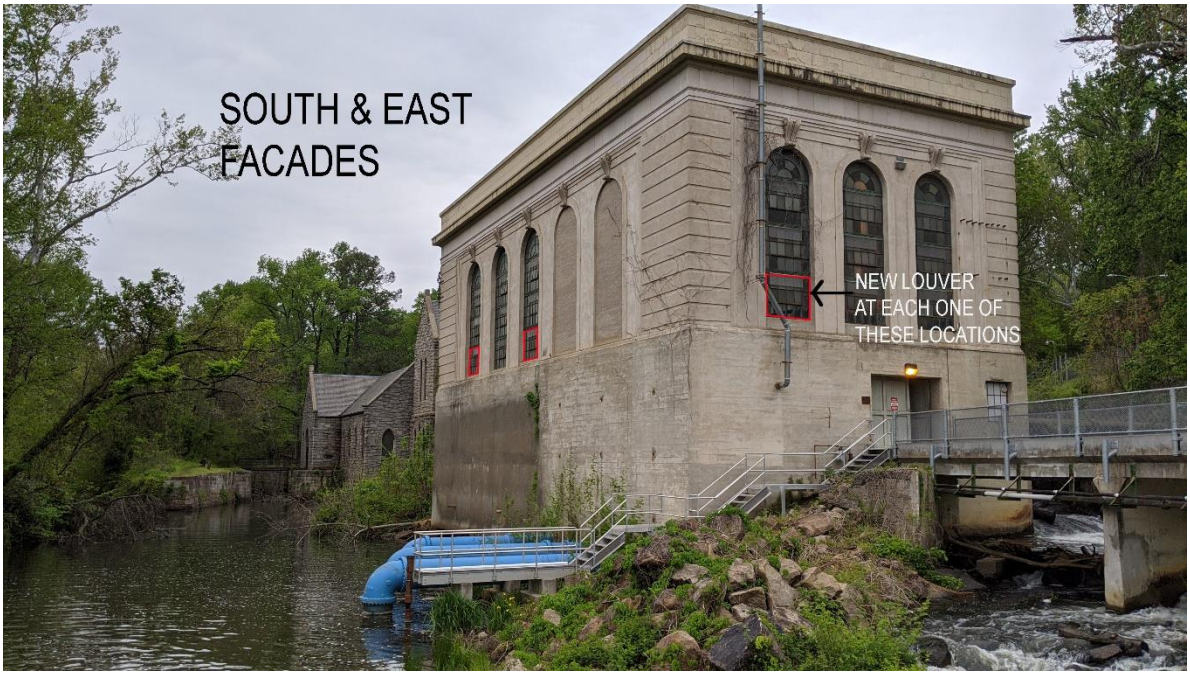
For functional purposes the proposed louvers have to be located on the lower portion of the building to allow air to be captured low and exhausted high up on the roof. To maintain the aesthetics of the station and the integrity of the façade, as well as the ventilation functional needs, the louvers need to be located at the bottom of the windows. The louvers will be made of anodized aluminum painted in a dark color to match the main sight lines and the green color of the existing window frames.

All broken glass panes will be replaced with single pane patterned glass. Glass pattern is specified to mimic the exiting pattern on the unbroken panes to maintain the building's original aspect.

All original glass that is in good condition will be cleaned and reused.

Once all glass is removed, any traces of putty will be removed from the original steel window frames, then cleaned thoroughly by mechanical means and coated to prevent rust and painted in a color to match existing.

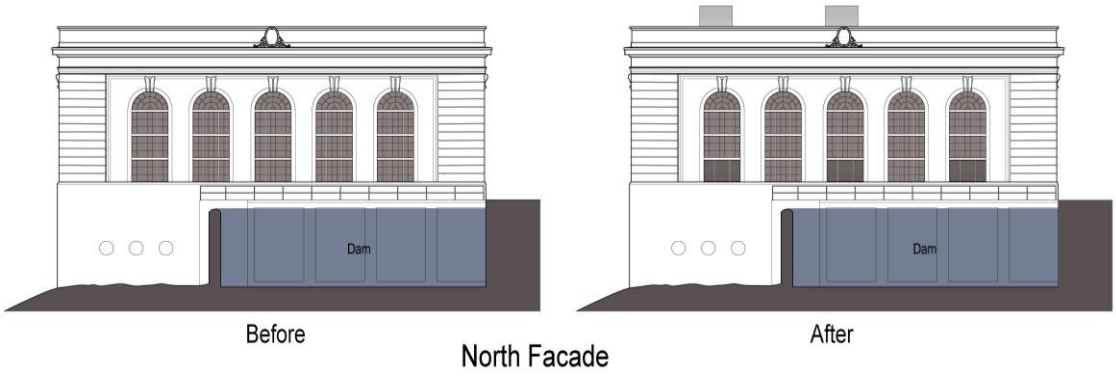
Glass panes are to be installed using the traditional glazing putty system (or modern equivalent) and painted to match the steel frame color.



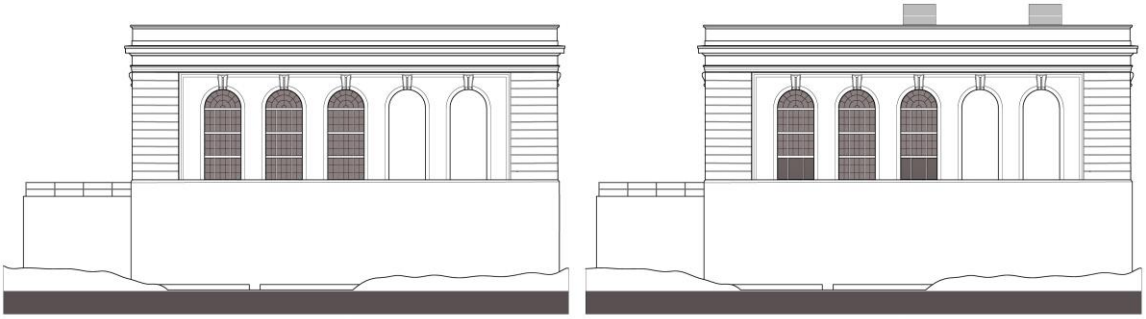
The North façade showing current blank off panels.

The North façade as it could look with the new louvers installed.

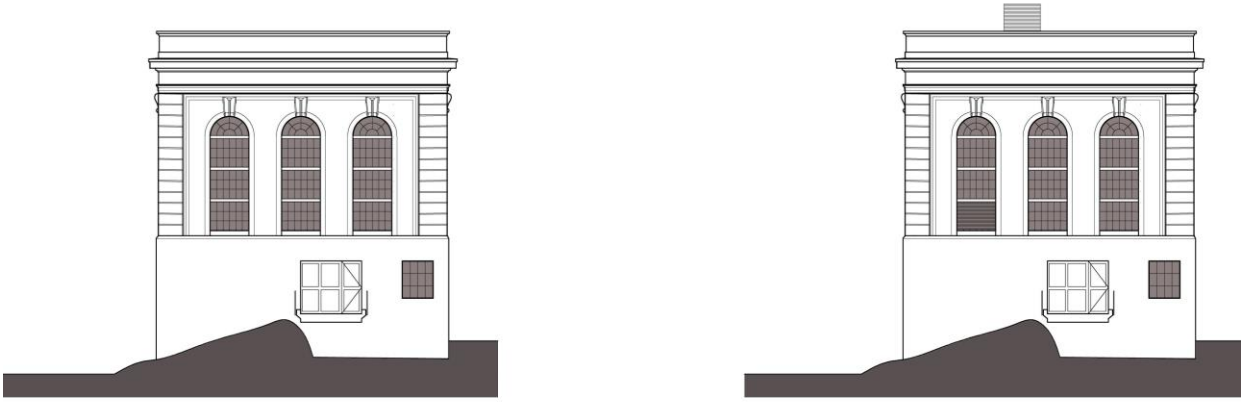
The drawings below show the original look of the facades and the proposed look after the new louvers are installed at the bottom window panel.



Before North Facade After



Before South Facade After

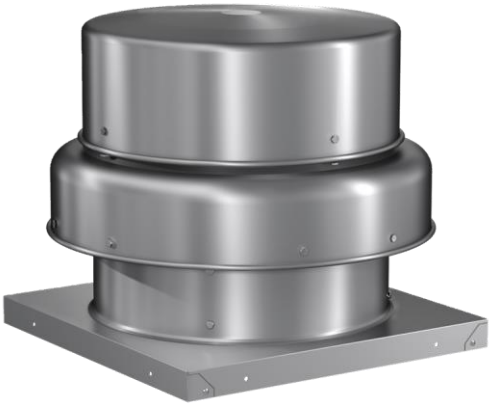


Before East Facade After

Roof Exhaust Fans

To provide the required building ventilation, exhaust fans are required to be installed on the roof. This way fresh air will be drawn into the building through the louvers at the bottom of the windows and pulled up to the roof and out to the exterior by the exhaust fans located on the roof. instead of installing conventional industrial type mushroom shaped exhaust fans, two new

louvered centrifugal fans will be located on roof to mitigate the visual impact they may have when seen from far away on the building façade.



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Conventional mushroom type fan

Proposed louvered type exhaust fan

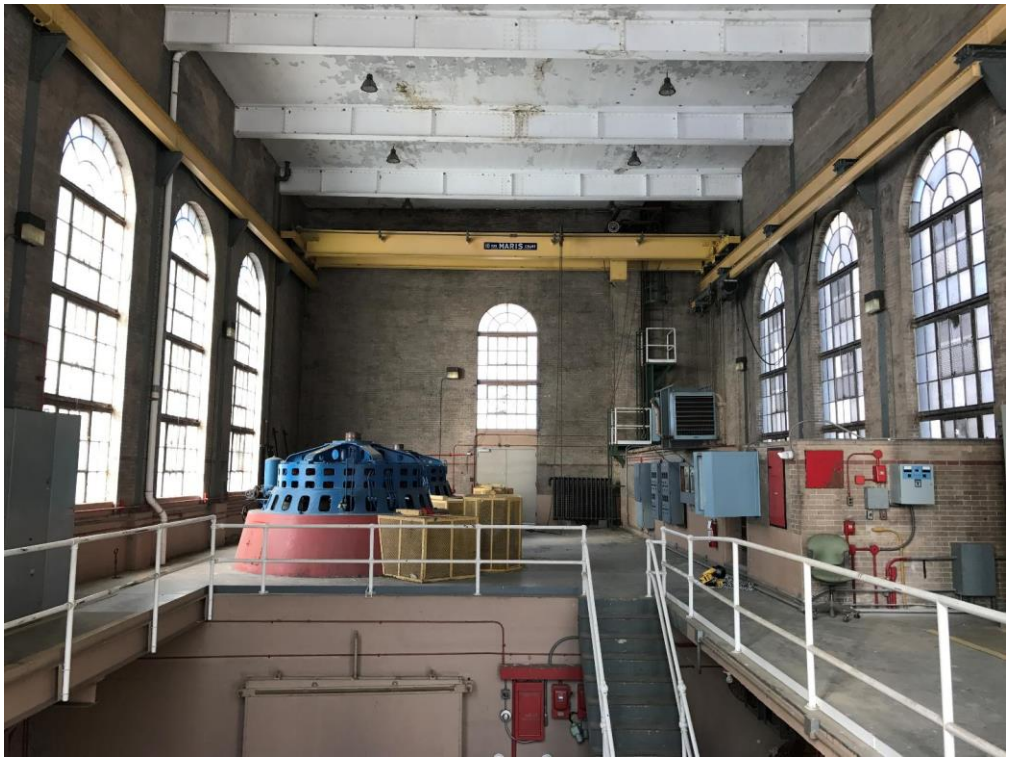
The louvered enclosure will be aluminum made and painted in a color to match the exterior stucco tone of the building's façade.

Existing Pump Station Photographs

Below are some photographs of the interior and exterior of the pump station.

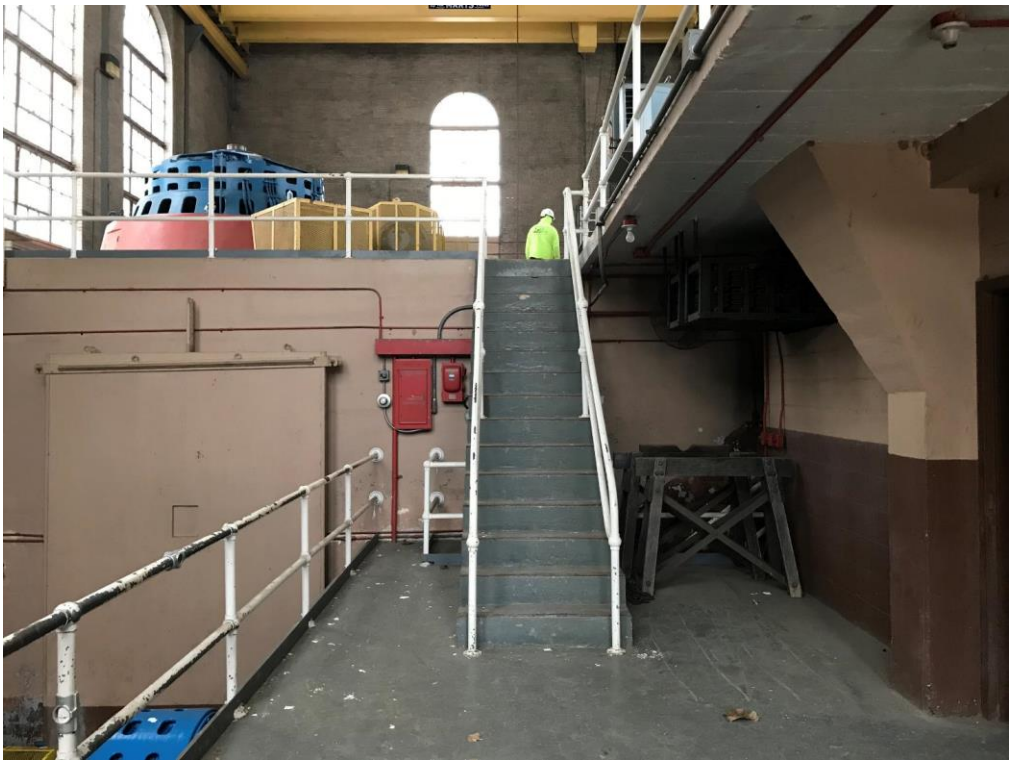
North façade showing the existing blank off panels at the bottom of the windows.

East service entrance



Main floor looking west.

Main floor looking east.



Entrance Level looking west.

Pump basement looking east.