US Army Corps of Engineers ®

New Jersey Back Bays Coastal Storm Risk Management

Atlantic County, Cape May County and Ocean County, NJ

Subject: Cost Engineering Appendix

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November 2024

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1. Cost Summary

Please see the Total Project Cost Summary (TPCS) attached to this Appendix and Base Estimate for a breakout of project cost.

2. Basis of Estimate

2.1. General

The cost estimate was developed in the Micro-Computer Aided Cost Estimating System (MCACES) second generation (MII). In MII,

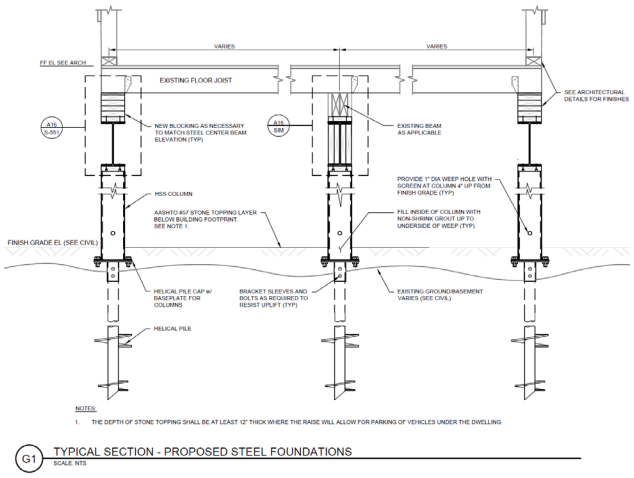
- Construction Specification Institute (CSI) tasks comprised of Labor/Equipment/Material sourced from RSMeans are based on the 2022 MCACES MII Cost Book
- Contractors are assigned to apply markups
    - Payroll Tax is based on New Jersey State
    - Workman's Comp Insurance Rate is based on New Jersey State, and the relevant Contractor Class
    - An Excavation/Earthwork Prime Contractor is assigned to basic earthwork activities, and Sub-Contractors are assigned to all other construction activities
    - Contractor Markups are as described in the `Markups` Section below
- Direct Cost Markups are applied per the `Markups` section below
- Labor rates are based on a project specific MII Labor Library
    - Field Labor Rates are derived from Davis Bacon Act Wage Determination NJ20240025 revision 07/12/2024.
    - Field Labor Rates are escalated to the most current date based on Federal Reserve Economic Data for `Employment Cost Index: Wages and Salaries: Private Industry Workers: Construction, Index Dec 2005=100, Quarterly, Seasonally Adjusted`
    - Professional Labor Rates are derived from the Salary.com Salary Wizard
    - Subsistence is not applied, because it is assumed local labor market will adapt to meet project demand without requiring additional labor outside the commute area
- Equipment rates are
    - Based on the 2nd revision of the MII Equipment Library for Region 01 from 2022
    - Adjusted for Land Fuel costs [Gas, Diesel (Off-Road, and On-Road)] per the U.S. Energy Information Administration (EIA), Gasoline and Diesel Fuel Update
    - Adjusted for Cost of Money based on Federal Register / Vol. 89, No. 138 / Thursday, July 18, 2024.
- The Notes section of Project Item folders provide additional information not contained within this Memorandum, which is for the Cost Engineers working directly in the MII Cost Estimate

2.2. Assumptions

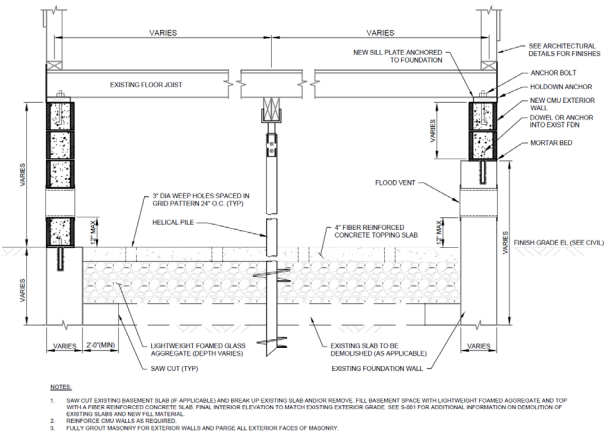
The estimated cost for each major subdivision or feature of the tentatively recommended project includes an item for "contingencies". The contingency allowances used in the development of the cost estimate for the tentatively selected project were estimated as an appropriate percentage using Abbreviated Risk Analysis software for preparing risk analysis. Contingency percent was applied to the work to account for concerns about the level of design, weather delays, available funding available from the Sponsor, and environmental mitigation requirements.

2.2.1. Non-Structural Raises

Non-Structural raises are based on another project: Pawcatuck Flood Risk Reduction House Raising South Kingstown, Rhode Island. Two cross-section details from that project were studied to create a parametric cost model for the non-structural residential raises:



G1 TYPICAL SECTION - PROPOSED STEEL FOUNDATIONS
SCALE: NTS



G11 TYPICAL SECTION - PROPOSED MASONRY FOUNDATIONS
SCALE: NTS

Non-structural raises with foundation types of Reinforced Slab on Grade, Pier, and Pile are based on detail G1 above. The remaining foundation types (i.e. Basement w/ Utility Room, and Crawl Space) are based on detail G11 above.

2.2.2. Floodproofing

Non-Structural floodproofing is based on a parametric cost estimate model for dry floodproofing. It is limited to a dry-floodproofing height of 3 ft, due to structural limitations from hydrostatic loading. Additional height above the 3 ft is not in the model. The dry-floodproofing cost estimate is based on the following:

- [A101010] Wall Foundations
  For any wall type that is not steel reinforced, it is assumed a wall foundation will be stubbed out from the existing masonry unit foundation to support a steel reinforced concrete Construction block wall. See [B201020] Exterior Wall shown in for the reinforced CMU block wall. The concept is Figure 5D-2, FEMA P-259 / January 2012.
- [A601010] Foundation Drainage
  drainage is assumed around the perimeter of the Foundation also shown in Figure 5D-2, FEMA P-259 / January structure as 2012.
- [B201010] Exterior Wall Veneer
  model assumes that every structure to be The cost waterproofed will have a rubberized/asphaltic membrane applied (e.g., Ice & Water Shield), and then a thin brick veneer installed over the top to protect the membrane. It is assumed the membrane will need to be protected from impact, abrasion, and ultraviolet (UV) light, to maintain its integrity. This concept is shown in Figure 2, above.

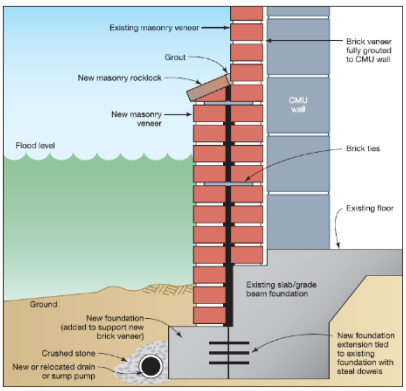
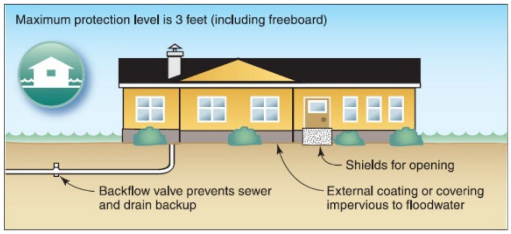


Figure 5D-2. A way to seal an existing brick-faced wall is to add an additional layer of brick with a seal in between. Please note that weep holes and wick drains work both ways to allow for moisture passage from high to low pressure. Weepholes and flashing should be located above the DFE, and the veneer below the DFE should be fully grouted.

- [B201020] Exterior Wall Construction
  This cost model assumes an 8" steel reinforced CMU wall is required to be added to the existing wall to resist hydrostatic loads satisfactorily during a flood event.
- [B208030] Exterior Opening Protection Devices
  The cost model assumes a system of custom door(s) + window floor barrier(s). It utilizes a sandwich panel design with a lightweight core, and metal skin, to provide the required depth to resist bending moment caused by hydrostatic loading, while remaining lightweight for personnel to handle. It is a non-proprietary system and it is similar to what can be found through an internet

search engine (e.g., https://www.floodproofing.com/custom-door-window-flood-barriers). Steel-faced, 2" thick, insulated sandwich panels are used as a proxy for this system. Steel-channel framing is installed on the edge of the panels to allow smaller panels to interlock together, with neoprene sheet waterproofing to form a seal, and wing nuts with lag screws to snug the system tight. The wall, and concrete pad in front of the openings (e.g., a door), is drilled, and threaded inserts epoxied in place, so that the panels can be anchored around the opening, with threaded rod and wing nuts. Elastic neoprene sheet waterproofing is also used at the interface of the panels and the building structure elements. When the panel system is not deployed, lag screws are installed to protect the threads and keep them clean.

- [F303010] Selective Building Demolition
  Depending on the wall type selected, the cost model will demolish the wall veneer (e.g., siding), if necessary, back to a sound surface for new construction to take place.
- [G101010] Clearing and Grubbing
  Clearing and grubbing is required around the perimeter prior to excavation for other construction activities in the cost model.
- [G102050] Selective Site Demolition
  Based on the percent (%) of asphalt or concrete around the perimeter of the building, the cost model will demolish those existing elements to allow construction of other components in the cost model.
- [G107020] Excavation and Fill
  Covers excavation around the perimeter of the building to support construction of other components in the cost model. It allows the rubberized/asphaltic waterproof membrane to be installed below grade, so that it may cover any joints between the wall and foundation. It also supports construction of the stubbed-out wall foundation and adjusts for whether a foundation drainage system is required.
- [G203010] Pedestrian Pavement
  Based on the percent (%) of asphalt or concrete around the perimeter of the building, the cost model will restore the pavement that was demolished to allow construction of other components in the cost model.
- [G208020] Turf and Grasses
  The non-pavement areas that are excavated require re-planting.
- [G302020] Sanitary Sewerage Piping
  The cost model assumes a backflow preventer is required to prevent sewage from piping into the building during a flood event. It assumes that that for buildings with a 6,000 square foot (SF) footprint or less, a 4" backflow preventer is adequate. Buildings with a footprint greater than 6,000 SF will get a 6" backflow preventer.



3. Basis of Quantities

Quantities for number of non-structural raises, and non-structural floodproofing's, were supplied by Planning and Economics. Key Assumptions, Surveying/Mapping, the structure raise foundation types (basement, crawl space, pier, pile, slab on grade), or floodproofing structure types (multi-residential, critical, commercial, industrial, public) were

determined parametrically from National Structure Inventory (NSI) data from 2022 that was supplied by Economics to Cost Engineering.

Those quantities for the number of foundation types per structure raise and the structure type for floodproofing were input into two different parametric cost model spreadsheets to calculate intermediary quantities based on the scope as described in `2.2 Assumptions` in the section above.

4. Markups

Markups, in the order that they are applied to items in the cost estimate, are listed below:

4.1. Direct

- Productivity = 80 % (for items that don't have user computed crew outputs)
- Sales Tax = 6.625% (NJ)
- 22MII CB Mat'l Escalation = 7.23% (RSMeans Quarterly Cost Construction Cost Index Updates)
- 22MII CB SubBid Escalation = 7.07% (RSMeans Quarterly Cost Construction Cost Index Updates)

4.2. Sub-Contractor

- Home Office Overhead (HOOH) = 10%
- Profit = 10%

4.3. Prime Contractor

- JOOH = 15%
- HOOH = 10%
- Profit = 10%
- Bond = 2%

5. Attachments

See the attached construction schedule prepared by the Cost Engineer in MS Excel.

6. Attachments

- Total Project Cost Summary, New Jersey Back Bays Coastal Storm Risk Management, Prepared 11/21/2024.
- MII report
- Civil Work Breakdown Structure
- Construction Schedule