

**GDOT GEOTECHNICAL BUREAU
WALL FOUNDATION INVESTIGATION (LRFD) REPORT CHECKLIST**

PI NUMBER _____ **DATE** _____ **REVIEWER** _____

Note: All N-values referenced throughout the checklist refer to corrected N_{60} values.

I. WALL ENVELOPE & PLANS

- ☐ Note the AASHTO LRFD Specification Edition and Year
- ☐ Note the wall characteristics (wall type, wall length, wall height and range of heights, where the wall changes direction, etc.)
- ☐ What is the purpose of the wall? Does the wall support a structure (roadway pavement, etc.) above it? Verify on relevant plan sheets such as mainline, cross-sections, etc.
- ☐ Does the wall have a slope above or below it? Verify on cross-sections
- ☐ Note the depth of embedment of the wall footing/leveling pad below final grade as well as the thickness of the wall footing/leveling pad.
- ☐ Note the elevation of the bottom of wall footing/leveling pad.

II. BORING LOGS, SOIL PARAMETERS & SITE CLASS

- ☐ Has the bottom of wall elevations been plotted on each boring log, and have the boring logs been plotted on the wall envelope?
- ☐ Has the hammer efficiency ratio / energy rating been included on each boring log? Make sure the hammer used was calibrated within two years of the drilling date. If multiple hammers were used for the same project, have the hammers been identified by serial number on the boring logs? Please include the SPT Hammer Calibration Report in the appendices.
- ☐ Have the N-values been identified as corrected or uncorrected on each boring log? Please note that only automatic hammers are acceptable.
- ☐ Were borings drilled on the active and passive sides of the wall?
- ☐ Note all areas with soft/loose soils, high moisture content soils, high groundwater near, at or above the bottom of wall, and walls in floodplains.

Note: After entering your boring log data into the LRFD Shallow Foundations Spreadsheet, it will flag all soft/loose soils or soils considered to be clay in different shades of red. These also include all soils with an OCR (Overconsolidation ratio) less than 3.

For walls in floodplains, the 100-year and 500-year flood elevations will be above the bottom of the wall. Check the wall envelope, preliminary bridge layout (if walls are at bridge abutments) and hydraulic study if necessary for this information.

- ☐ Have the soil parameters (Retained if applicable and Foundation Soil) been generated using the LRFD Shallow Foundations Spreadsheet or an acceptable alternative methodology? If an alternative methodology was used, have supporting documentation been included in the appendices of the report?
- ☐ Have the recommended soil parameters been sent to the bridge office/wall designer using the “LRFD Soil Parameter Recommendation” template?
- ☐ Have the seismic site class analyses been performed using the N-Values for each boring? An N-value of 1 should be used for Weight of Hammer (WOH) material.
- ☐ New fill to be brought to the site should not be evaluated for site class, and material to be permanently removed from the site does not have to be included in the first 100 feet of material evaluated for site class.
- ☐ For borings shallower than 100 ft, an N-value of 100 bpf should be used from termination to 100 ft if auger refusal or rock is encountered. Otherwise, the last N-value should be assumed to continue to a depth of 100 ft.
- ☐ Ensure that the most representative site class was selected, not an average across borings. In a situation where there is equal representation of two or more site classes across the borings, the worst case should be used. If there are multiple borings at a single bent, each specific boring should be analyzed individually for site class. N-values across borings at the same bent should not be combined.

III. WALL FOUNDATION DESIGN DATA

Ensure that the wall foundation design data shown on the WFI report is the same as the design data recommended on the letter from the wall designer. The following should be provided:

- ☐ Wall Number and type (If applicable)
- ☐ Wall Height and corresponding Location
- ☐ Footing Width (for rigid retaining walls)
- ☐ Strap Length (for MSE walls only)
- ☐ Bearing Pressure (at the strength and service limit states)
- ☐ Effective Footing Width (for rigid retaining walls, at the strength and service limit states)
- ☐ Effective Strap Length (for MSE walls only, at the strength and service limit states)

Note: For global stability analysis, the surcharge load for walls supporting structures and traffic is typically 250 psf. Confirm with the structural engineer that this is fine to use for your project.

IV. SHALLOW FOUNDATION ANALYSIS

- ☐ Have factored bearing resistance analyses (LRFD 10.6.3.1.1-1) been performed using the GDOT LRFD Shallow Foundations Spreadsheet or an acceptable alternative LRFD methodology? Is the factored bearing resistance greater than the strength limit state bearing pressure provided by the wall designer?
- ☐ Have resistance factors specified in section 3.1 of the GDOT WFI-LRFD Template or the AASHTO LRFD Manual been used?
- ☐ Have settlement analyses (LRFD 10.6.2.4) been performed using the LRFD Shallow Foundations Spreadsheet? Does the result meet the GDOT limit of 1 inch for rigid retaining walls, 4% of maximum wall height for an MSE wall with a structure above it and 8% of maximum wall height for an MSE wall without a structure above it?

Note: Since the GDOT LRFD Shallow Foundations Spreadsheet has an iterative relationship between bearing resistance and settlement, we require that both are evaluated in the strength limit state to be conservative, but only if the spreadsheet is used. Also, additional settlement analyses such as secondary consolidation and long-term creep will be required if a significant thickness of compressible/cohesive soil layers are present.

- ☐ If the GDOT LRFD Shallow Foundations Spreadsheet was used for analyses, has the bearing resistance been limited based on settlement magnitude?
- ☐ Have differential settlement analyses been performed and included in the appendices of the report? (GDOT has a Differential Settlement Spreadsheet to help with this analysis) Do all wall sections meet the LRFD limits for rigid retaining walls as stated in LRFD C11.6.2.2 and the limits stated in LRFD C11.10.4.1-1 for MSE walls?
- ☐ For global stability of the wall, has the static loading (LRFD 11.6.2.3) case been investigated? For projects in seismic zone 2 or higher and seismic site class E or F, has the seismic loading (LRFD 11.5.8) case been investigated in addition to the static loading case?
- ☐ Have liquefaction potential and risks been evaluated? Any analyses performed to this effect should be included within the Appendices.
- ☐ If the wall fails global stability analysis, have geotechnical solutions been evaluated first before solutions that will change the structural design of the wall?
Note: For solutions that alter the structural design of the wall, the Geotechnical Engineer of Record must collaborate with the Structural Engineer prior to the completion of the WFI report. The WFI should include all necessary details of the solution evaluated to mitigate global stability failure.

V. SOFT, COHESIVE AND COMPRESSIBLE SOILS

- ☐ Note the presence of soft, cohesive, compressible, and/or liquefiable soils.
- ☐ Is an undercut needed due to shallow soft or poor soils? If so, specify station range and depth of undercut, as well as the replacement material to be used.

- ☐ Will ground improvement methods such as wick drains, surcharge, compacted aggregate piers, rigid inclusions, etc. be required to mitigate the poor soil conditions? Refer to the NHI Ground Modification Methods – Volumes 1 and 2 for various ground improvement options.

Note: Any ground improvement method used will typically be a contractor-designed item and will require a special provision (if not already a GDOT standard specification item) which must be approved by the Geotechnical Bureau.

- ☐ Will deep foundations be needed for locations where layers of soft/loose soils more than 10 feet are directly beneath the bottom of wall?

Note: The use of deep foundations and load transfer platform (LTP) will typically be a contractor-designed item and will require one or more LTP detail drawings, as well as a special provision which must be approved by the Geotechnical Bureau.

Note: Include all necessary details for recommended ground improvement strategies where applicable.

VI. FOUNDATION RECOMMENDATIONS

- ☐ Have the factored bearing resistance and total settlement been listed under this section?
- ☐ The reported bearing resistance should exceed the wall bearing pressure while yielding the lowest amount of settlement.
Note: This only applies if the GDOT LRFD Shallow Foundations Spreadsheet and Methodology was used for design.
- ☐ GDOT Settlement limits are 1 inch for rigid retaining walls, 4% of maximum wall height for an MSE wall with a structure above it and 8% of maximum wall height for an MSE wall without a structure above it. If these limits have been exceeded, options should be evaluated to mitigate the excessive settlement.
- ☐ If deep foundations are being recommended, have the pile foundation design and elevations been reported under this section?

VII. OTHER WALL TYPES (soil-nail, tie-back, soldier pile, etc.)

Have the following assumed or designed parameters been included in the WFI report for these wall types?

- ☐ Minimum and Estimated tips (soldier pile walls only)
- ☐ Global Stability Analyses for the critical sections of the wall(s)
- ☐ Anchor / Nail Length
- ☐ Vertical and Horizontal Spacing of the Anchors/Nails
- ☐ Angle of Inclination of Anchors or Nails
- ☐ Bond Stress, Tensile Strength of anchor/nail and Grout Strength

If the wall is modeled as a block with infinite strength, then only the first three parameters above should be provided. The anchor/nail length shall be considered the length of the block.

VIII. NOTES

- ☐ Elevation – make sure the elevation indicated here is consistent with the reference elevation/benchmark on preliminary bridge layout, survey control package, or document containing benchmarks established by a Georgia registered land surveyor for the project.
- ☐ Will waiting period(s) be needed to control the rate of settlement? If so, has staged construction been specified by wall height? Will an additional waiting period be needed after final stage of wall construction/fill placement and prior to pavement construction to reduce the potential of pavement distresses if applicable?
Note: If a waiting period of more than 60 days has been recommended, time rate of settlement calculations must be provided as back up. If waiting period exceeds 90 days, mitigation other than waiting periods needs to be evaluated.
- ☐ Vibration Monitoring – this is required for structures located within 75 feet of the vibration source (wall), regardless of the historical status of the structure. The distance should be measured from the structure to the closest point of the wall.
- ☐ Settlement Monitoring – If more than 6 inches of settlement is anticipated, a settlement monitoring program is needed. Have you specified how often settlement monitoring points should be along the wall? Have you specified how often settlement data should be collected by a surveyor? Have you provided the criteria for which settlement monitoring can be terminated?
Note: For deviations from the frequencies provided in the WFI template, justification must be provided.
- ☐ Settlement Monitoring – How much long-term settlement is expected? Will the recommended ground improvement suffice? Think about GDOT maintenance efforts in the long run.
- ☐ If groundwater is near, at or above the bottom of wall elevation, has some form of drainage been setup? Have you specified that there should be drainage through the wall?
- ☐ For walls in floodplains, has a free draining material been recommended as MSE wall backfill material up to at least 2 feet above the high flood elevation?
- ☐ Is temporary shoring needed to construct the wall foundation?

IX. OTHER/SPECIAL PROBLEMS

- ☐ Special Provisions – ensure that all special provisions are up to date and have the correct revision dates indicated. (SP 154 for vibration monitoring, SP 809 for geogrid, SP 881 for fabrics, etc.)
- ☐ Details – please make sure all applicable construction details have been included in the appendices of the report.
- ☐ Other notes – Have all notes pertaining to special requirements that don't have a special provision been included?

X. APPENDICES

- ☐ Preliminary wall envelope*
- ☐ Details
- ☐ Figures
- ☐ Foundation design data letter from structural engineer
- ☐ Soil classification test results
- ☐ All other test results (consolidation, triaxial, corrosion, etc.)
- ☐ Rock core pictures and test results (if applicable)
- ☐ Finished boring logs
- ☐ Finished boring layout
- ☐ Site photographs and reconnaissance reports/field notes
- ☐ Site map
- ☐ Previous site information, such as copies of old WFI and Plans (if applicable)*
- ☐ Relevant plot(s) from the LRFD Shallow Foundations Spreadsheet analyses*
- ☐ Calculation sheet(s) (for site class, secondary consolidation, time rate of settlement, etc.)*
- ☐ Any other analysis as needed (slope/global stability, lateral stability, etc.)*
- ☐ SPT Hammer Calibration Report*

* For In-House projects prepared by GDOT Engineers, these appendix items do not have to be attached to the report, however they must be included in the appropriate subfolders of the ProjectWise project folder.