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**MILTON SCHOOL DISTRICT
NUTE HIGH SCHOOL**

*22 Elm Street
Milton, New Hampshire*
PROJECT # 15407

SEPTEMBER 10, 2015

1959 ADDITION ROOF REINFORCEMENTS ANALYSIS



NUTE HIGH SCHOOL 1959 ADDITION ROOF REINFORCEMENTS ANALYSIS

Introduction and Overview

This report summarizes the roof reinforcing and an estimate of probable cost for the Nute High School 1959 addition roof reinforcements, in accordance with our proposal dated April 29, 2015. A previous report dated August 14, 2014 discussed the general condition of the high school, anticipated dead loads, code snow loads and general framing capacities.

Information concerning the framing sizes and condition was obtained from the existing building drawings that were produced for the project and visual observations conducted during two site visits in July of 2014. It should be noted that the scope of this study is limited to reinforcements and estimate is limited to the 1959 addition only. Other areas noted in our previous report are not part of this study.

The existing 1959 addition roof is comprised of a poured gypsum deck over steel joists supported on steel beams and/or load bearing concrete masonry units (CMU). The steel beams are supported either on steel columns or load bearing CMU. At the gymnasium the roof is comprised of 2" thick wood decking.

Code Analysis

The 1959 addition to the Nute High School was analyzed using code stipulated loads per the 2009 International Building Code (IBC) and the Cold Regions Research and Engineering Laboratory ERDC/CRREL TR-02-6 report for ground snow loads in New Hampshire. The ground snow load is stipulated as 90 pounds per square foot (psf) at an elevation of 800 feet. The elevation of the high school is approximately 480 feet and therefore a reduction in the ground snow load can be taken and results in a ground snow load of 87.3 psf. The ground snow load of 87.3 psf results in a flat roof snow load of 64.5 psf and includes an importance factor of 1.1 for schools. The existing dead load on the roof was found to be approximately 20 psf plus any self-weight or additional dead load due to the support of CMU/brick. At the gymnasium the dead load was found to be approximately 15psf.

Our analysis shows the majority of the steel beams and joists are overstressed by approximately 20 to 60 percent. Reinforcing is necessary to meet current code stipulated loads.

Reinforcing

Reinforcing to steel I beams will typically be a steel channel welded to the beam web to increase the section properties. The increased section properties allow for additional load carrying capacity. To reduce the load carried by the existing joists, additional joists will be installed between the existing ones. The new joists will be two piece joists with a splice located in the middle to aid in the installation process. Reference the associated roof framing plan for location and size of above noted reinforcing.

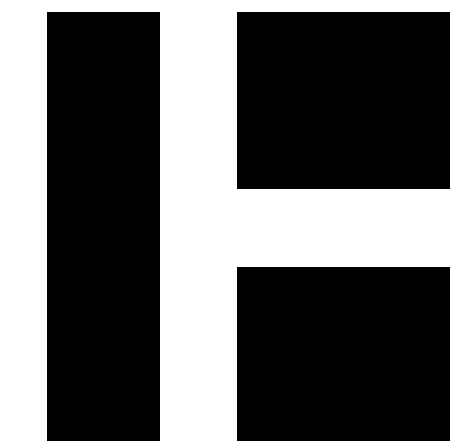
The installation of the beam web reinforcing and the new joists requires that any mechanical equipment, piping, joist bridging, conduit, etc. be removed and reinstalled if in the way of the new framing. The removal and reinstallation of existing items could have significant cost implications. Additionally, the reinforcing and additional joists will require welding. Any welding inside an existing structure requires extra care and time to ensure furniture, coverings, floorings, etc. are not damaged.



NUTE HIGH SCHOOL 1959 ADDITION ROOF REINFORCEMENTS ANALYSIS

Summary

Our opinion of probable cost for the proposed reinforcing noted and on the accompanying framing will be between \$450,000 and \$510,000. This estimate includes structural steel, selective demolition, shoring, temporary protection, acoustical ceilings and materials/labor needed to remove and reinstall any ducts, pipes, etc. in conflict with the installation of the roof reinforcing. We recommend our estimate be quantified and confirmed by a general contractor experienced in similar type project. This project may benefit from the involvement of a construction manager.



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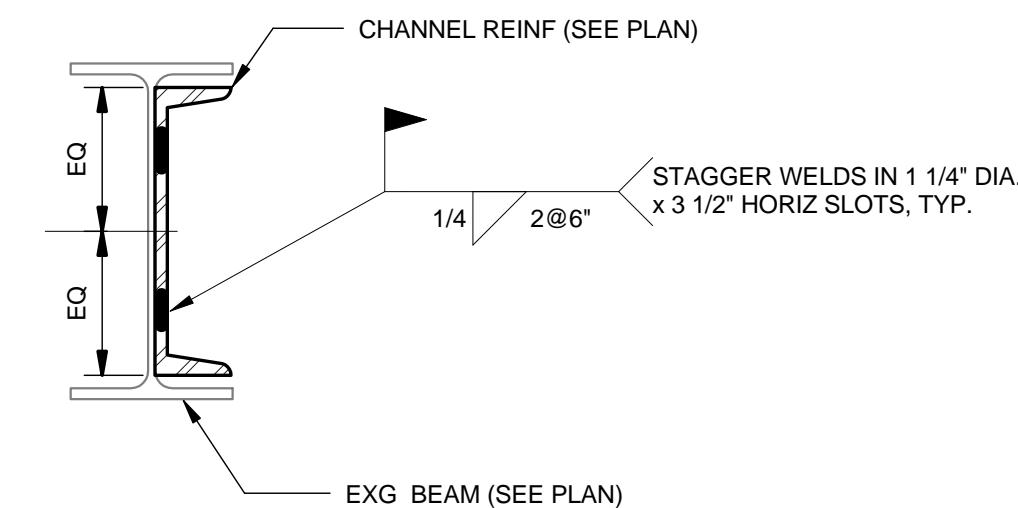
AUBURN PORTLAND MANCHESTER

SAU #64 MILTON SCHOOL DISTRICT NUTE HIGH SCHOOL 1959 ROOF REINFORCEMENTS

MILTON, NEW HAMPSHIRE

Harriman Project No. 15407

Key Plan Proj North



1 Typical W Beam Reinforcing

SCALE: 1 1/2" = 1'-0"

NOTES:

- 1. D1 INDICATES SPAN DIRECTION OF EXISTING POURED GYPSUM ROOF DECK.
2. D2 INDICATES SPAN DIRECTION OF EXISTING T&G WOOD DECK.
3. G.C. TO VERIFY EXISTING ELEVATIONS, DIMENSIONS, ETC. PRIOR TO FABRICATION.
4. ALL EXISTING BRIDGING REMOVED TO INSTALL NEW JOISTS SHALL BE REPLACED PER SJI SPECIFICATIONS.

Issues and Revisions

Table with 3 columns: Mark, Date, Description. Row 1: 9/10/15 FINAL REVIEW.

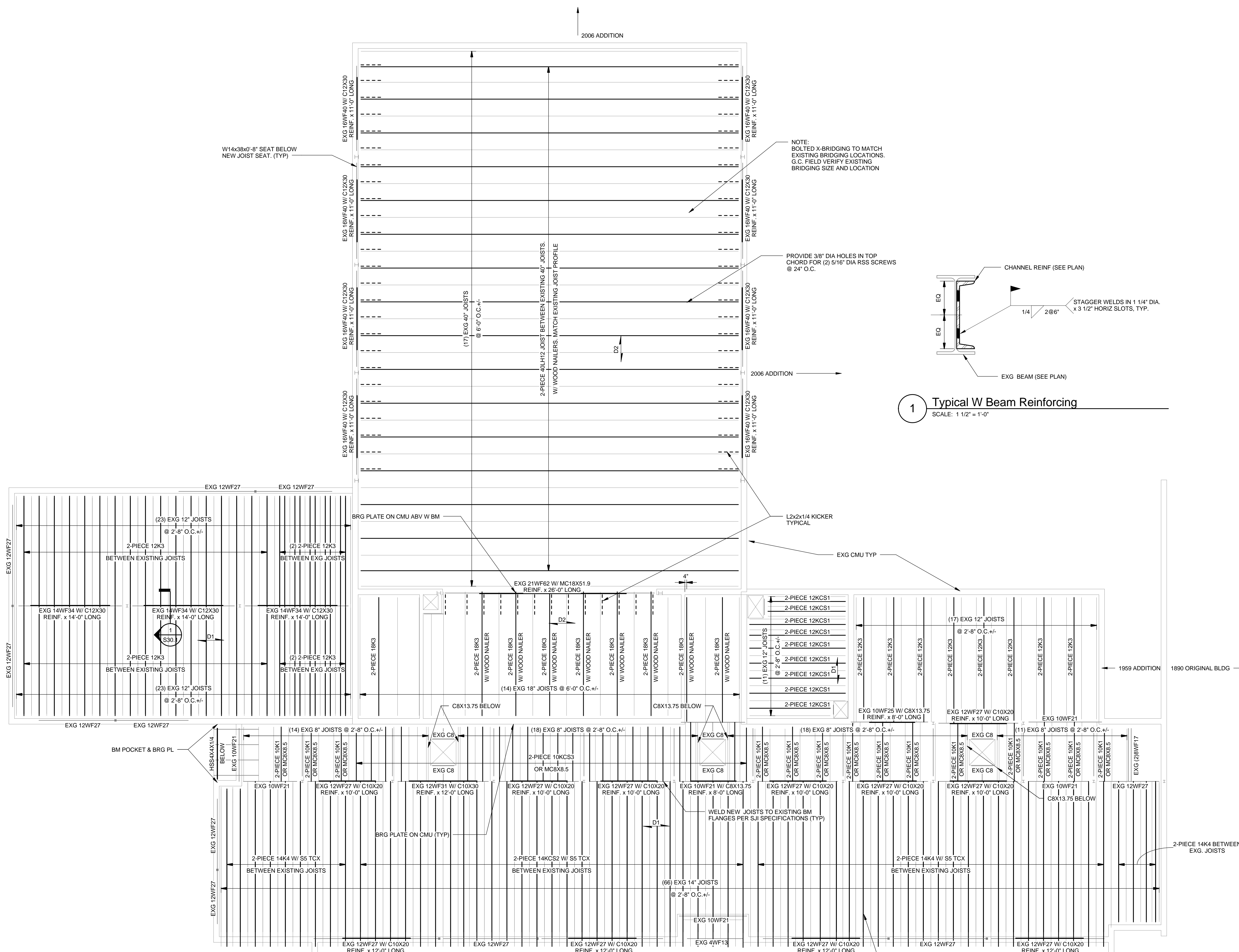
PRELIMINARY NOT FOR CONSTRUCTION

Drawing Scales: 0 4' 8' 12' As indicated 1/8" = 1'-0"

PA / PE: JCF © 2015
Drawn By: MRM Harriman Associates

ROOF FRAMING PLAN

S30.1



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