NORTH CREEK TRAIN STATION COMPLEX

STRUCTURAL INVESTIGATION

Prepared by:

Schoder Rivers Associates
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, NY 12804
(518) 761-0417

Shaun M. Rivers, PE

Client: Town of Johnsburg
219 Main Street
North Creek, NY 12853

Date: April 20, 2012

AUTHORIZATION

Schoder Rivers Associates has been retained by the Town of Johnsburg, NY to perform a structural evaluation of three existing buildings at the North Creek Train Station complex. It is our understanding that all three buildings are on the National Register of Historic Places. In a letter form James Warren of the New York State Office of Parks, Recreation and Historic Preservation to Wayne LaMothe of Warren County these buildings are described and labeled as follows:

Building #1 - Stables Building
Building #2 - Scales Building
Building #3 - Warehouse or "T" Building

Please see attached Sketch Sk-1 in Appendix C for a drawing showing the relative size and location of these buildings. This drawing is for the purpose of this study only and was taken from an overlay of a previous project and is used only for description purposes.

The purpose of this evaluation is to investigate the feasibility of stabilizing and repairing these structures so that may remain structurally stable when subjected to the most commonly expected loading conditions. It does not mean that the buildings would be expected to withstand all loading conditions expected of a new building designed in accordance with the Building Code of New York State (Building Code). Long term, it is hoped that these buildings can be restored and become a long standing part of the North Creek Train Station Complex. In addition as part of this evaluation, we have been asked to assess the feasability of converting Building #3 to year round public use. Currently this building is used seasonally, primarily for storage.

This report summarizes our observations, conclusions, and offers recommendations for further action.

OBSERVATIONS

We visited the site on January 30, 2011 and February 10, 2011, to record dimensions of key structural elements and to assess the condition of the buildings and structural framing. Our observations for each building are summarized below. Each section will give a general description of the structure, a description of the structural framing, and a section noting specific observed deficiencies.

Building #1 - Stables Building

The Stables Building is a rectangular building of approximate 81' x 18'-6" dimension. The building is of wood construction with wood Dutch lap style siding and a metal standing seam style roof (See Photograph 1). The building is single story with a loft area supported by timber framing which also adds lateral stability to the building. The roof is supported by standard rafter framing and purlins bearing on a wood stud knee wall which projects above the loft level. A portion of the first floor has a concrete slab. The remainder of the floor is wood framing elevated slightly above ground level. See attached Sketch Sk-2 and Sk-3 for plans and a typical section through the building showing the typical key structural framing.

Key structural framing elements can be summarized as follows:

Roof and Wall Framing:

- 5.75" x 2" rafters at 32" c-c with no ridge board (See Photograph 2)
- 1x6 to 1x8 lathe boards laid flat on rafters supporting metal roof deck
- Rafters bear on a knee wall with a double 2" x 5.75" plate. Plate bears on 6x6 wood posts spaced at 11'-3" to 11'-6" c-c. Wall studs consist of 2x4 full studs placed between the 6x6 posts at about 26" c-c. (See Photograph 3)
- A 6x6 tie beam connects to each 6x6 post with a mortise and tenon connection above the loft framing level (See Photograph 4). A knee brace connects the tie beam to each post.

Loft Framing:

- Loft floor framing consists of full 2x8 joists at 3' approximate c-c spacing spanning the width of the building. The joists are lapped about 9' in the middle of their span (See Photograph 5). The loft floor consists of 1x8's laid flat on top of the joists.
- The floor joists bear on a platform framed stud wall consisting of a single full 2x4 top plate with full 2x4 studs spaced at about 16" to 24" c-c (See Photograph 6). The 6x6 posts span from the roof level to the foundation.
- 1x8 ship Dutch lap style wood siding is directly attached to the wall studs.

Foundation and Floor Construction:

- Wall studs and 6x6 posts bear on an approximately 4x6 plate. The plate bears on stone that projects about 10 inches below outside grade (See Photograph 7). Outside grade is only a couple inches below floor level.
- On the south portion of the building there is a wood floor consisting of 2x8's spaced at about 24" c-c. Full 2x8's are laid flat on top of the joists to create the floor.
- The north portion of the building has a concrete floor slab of unknown thickness (See Photograph 8).

Building Condition and Observed Deficiencies

The upper portion of the building above the floor slab elevation is in fair condition. Some items observed include the following:

- The bottom portion of one of the roof rafters was decayed (See Photograph 9).
- The knee brace in a least one location has pulled away from the tie beam (See Photograph 10).
- In one location the original knee brace was removed and replaced with a 2x8 nailed brace running upward from the tie beam.
- In several locations the bottom of the 6x6 post is decayed at the foundation level (See Photograph 11).
- The metal roof is rusted and in poor condition.
- The wood floor is in poor condition with decayed members near the exterior walls.

Building #2 - Scales Building

This building is also a rectangular building with overall dimensions of 30 feet x 50 feet (See

Photograph 13). Construction is wood framing with the roof supported by a truss system, which also supports the attic floor. The roof trusses consist of timber beam and steel or cast iron rod members. One of the roof trusses has failed causing a portion of the roof to collapse. This section of roof is presently covered with a tarp (See Photograph 12). Attached to the building is a concrete pit which housed the scale mechanism. This pit is covered with a canopy of wood construction. The building has a first floor of concrete slab on grade construction and concrete foundation walls, which supports the exterior walls. See Sketch Sk-4 for a plan of the attic and floor framing.

Key structural framing elements can be summarized as follows:

Roof and Attic Framing:

- Roof rafters are 1.75" x 5.75" wood joists at 3 foot c-c spacing wit a 1.5" x 5.75" collar tie (See Photograph 14).
- 1 x 9 plank laid flat are nailed to the joists and support a metal roof deck.
- The roof rafters are supported by a 2.5" x 5" purlin which runs the length of the building at approximately the mid-span of the rafter. The purlins are supported by a 2.5" x 5.5" post at each truss location. The post bears down at an angle to the diagonal truss support members (See Photograph 16 and Sketch Sk-5).
- The trusses consist of a horizontal top chord with two diagonal top chord support members at each side. The diagonal members continue to the truss bottom chord and are let-in to the bottom chord. The top chord is made up of three 2" x 5.75" members nailed together. At the intersection of the diagonal and horizontal members an iron or steel rod connects the top chord to the bottom chord (See Photograph 15). The bottom chord is a solid 6" x 8" timber. The trusses are spaced at about 10 feet center to center and span the width of the building.
- The truss bottom chord is supported by a solid 6x6 timber column with a mortise and tenon joint. The columns continue up to a 6x6 timber beam which supports the rafters. Knee braces of 4x3 solid lumber connect the upper beam to the columns in the long direction of the building.
- 2x6 floor joists spaced at 3 feet c-c bear on top of the truss bottom chord. 1x planking of various widths is nailed to the floor joists to create the attic floor.

Exterior Wall, Slab and Ceiling:

- Approximately mid span between the truss support columns is an additional 2.5" x 6" stud. Dutch lap 1x8 siding is nailed to the columns and studs on the exterior side. 1x boards have been nailed to the interior side of the columns and posts and support gypsum wall sheathing.
- A ceiling constructed of 2x4's runs between the truss bottom chord beams and also supports gypsum sheathing.
- The truss support columns and intermediate studs bear on a 4" x 5" solid wood plate. The wood plate bears on a concrete foundation wall. Footing conditions and depth are unknown.
- First floor construction consists of a concrete slab on grade. Grade on the north, west, and south walls is very close to the first floor elevation.

Scale Pit:

- The scale pit is located on the south side of the building. The scale pit is constructed of concrete foundation walls and a concrete base slab. Concrete piers support the steel framing which makes up the mechanism of the scale (See Photographs 21, 22 and 23).
- Two steel beams run the length of the pit and support 3 ½" x 9 ½" wood planking which is the top bearing surface of the scale.
- The scale pit has a roof enclosure with a wood stud bearing wall on the south side. The roof is a simple shed structure with 2x6 at 24" c-c rafters. 1x planking is nailed to the top of the joists and supports a standing seam metal roof. The south bearing wall of 2x4 studs at 24" c-c spacing supports the rafters (See Sk-4). 1x7 lapped siding is nailed to the studs.

<u>Building Condition and Observed Deficiencies</u>

Overall the Scales Building is in poor condition. Viewed form the outside the roof ridge line has a noticeable sag. On the north side of the building the siding has a noticeable sag in the middle of the building (See Photographs 12 and 13). Both of these items indicate significant settlement, mostly due to decayed or failed wood members. Specific observed items include:

- The second truss in from the west side of the building has collapsed (See Photograph 17). This has caused the purlins supporting the rafters to pull away from their post supports in several locations. The connection of the truss to the building column is completely rotten at this location (See Photograph 18).
- The entire attic floor is sagging. It can be anticipated that several of the other truss to column connections are compromised. The north side of these connections could not be observed due to the unsafe condition of the attic floor.
- The 4x6 plate that supports both the truss support columns and the wall studs is severely decayed in several locations for much of its length (See Photographs 19 and 20).
- The brick masonry chimney on the east side of the building is deteriorated with large vertical cracks at the top and appears unstable (See Photograph 25).
- The metal roofing is rusted and in poor condition.
- The shed roof over the scale pit is in poor condition. Most of the planking on top of the joists are rotten. A large number of rafters have dry rot and two rafters are split and have essentially failed (See Photograph 24). The standing seam metal roof is rusted, with holes, and is in poor condition.
- The collar tie at the first rafter at each end of the Building is missing.
- The concrete foundation wall in the south-east corner of the building is cracked and in poor condition.

<u>Building #3 - "T Building"</u>

The "T-Building" consists of the main building of approximate 96 feet x 30 feet dimension (See Photograph 26 and 27). An addition of 22 feet x 76 feet was added on the south side of the original building (called Addition in the remainder of the report). A large sliding door connects the two buildings. The buildings are single story of standard wood framing construction. These buildings appear to be much newer than the Stables and Scales Buildings, since the framing is fairly standard with dimension lumber and standard nails used. Unlike the Stables and Scales Building there were no mortise and tenon joints or heavy timber type construction. The roof framing consists of the trusses of dimension lumber members with nailed connections. The east portion of the Addition has been recently replaced with new wall framing and standard metal plate connected wood trusses. The roofing is a fairly new exposed fastener style metal roof. The siding is Dutch lap wood siding except the replaced section of the Addition has standard bevel wood siding. The first floor is concrete slab on grade and the exterior stud walls appear to bear on a concrete foundation wall. See Sketch Sk-6 for a Plan of the T-Building.

Key structural framing elements can be summarized as follows:

Main Building:

- The Main Building roof framing is a combination rafter and truss system (See Photograph 28). Rafter framing consists of full 2x6 rafters at 24" c-c spacing. The rafters but to a ridge board at the ridge and bear on a (2) 2x4 plate at the top of the stud wall with a “Birdsmouth” cut. The new metal roof is attached to 1x planking which is nailed to the rafters. At every other rafter, 48" c-c, there is a double 2x6 collar tie at the top of wall plate elevation. The double 2x6 is lapped and nailed. Two diagonal members and a vertical member of full 2x6 complete the truss (See Sketch Sk-7). All connections are nailed. There are additional diagonal braces at 48" c-c from the wall studs up to the rafters.
- Wall framing consists of 2x4 studs at 24" c-c spacing with a double 2x4 top and bottom plate. The bottom plates bear on a concrete foundation wall. Anchors were not visible connecting the plate to the foundation, but they may be on the bottom plate only and could not be observed. Dutch Lap siding is nailed directly to the studs. Furring has been added to the 2x4 studs recently. Apparently this was done in anticipation of putting a finish on the interior side of the wall.
- At the time of our field visit ice was present on the interior concrete slab (See Photograph 29).

Addition to Main Building:

- The west side of the Addition is of the original construction. Roof framing consists of simple 2x6 rafter framing at 24" c-c spacing (See Photograph 30). There are 2x6 collar ties at both the top of wall elevation and at 3'-6" below the ridge (See Sketch Sk-8). The new metal roof is attached to 1x planking, which is nailed to the roof rafters. The rafters bear on a 2x4 at 24" c-c stud wall with a double and bottom top plate (See Photograph 31). The bottom of the wall bears on a concrete foundation. Dutch lap siding is directly nailed to the studs.
- The east side of the Addition has recently installed new wall and roof framing. Roof framing consists of pre-fabricated metal plate connected wood trusses spaced at 16" c-c (See Photograph 32). The new metal roof is attached to 1x planking which is nailed to the roof trusses. The trusses are supported by 2x4 wall studs at 16" c-c with a double top plate and single bottom plate. The wall studs were grade stamped as No. 2 SPF as graded by NLGA. The wall bears on a concrete foundation wall. Standard bevel wood siding is attached directly to the studs.
- Where the Addition abuts the Main Building the roof trusses and rafters are supported by a 2x6 ledger which is nailed through the original exterior siding to the wall studs (See Photograph 33).

STRUCTURAL ANALYSIS

Each building was reviewed for its ability to withstand loads as required per the Building Code of New York State (Building Code). This analysis was based on the materials being in good condition. Those areas requiring repairs to restore the materials to a good condition are discussed in a later section. Since the wood is old, there are no grade stamps on the lumber or timbers. Timber samples were taken from several members and sent to Susan Anagnost, Ph.D. of the State University of New York, College of Environmental Science and Forestry for species identification. All of the members were identified as Spruce, with the exception of the rafters in the Stables Building which were Balsam Fir. See Appendix B at the end of the report for the results of the species identification. For purposes of engineering analysis, the lumber or timber was assumed to be Eastern Spruce with the exception of the Stable rafters, assumed to be Balsam Fir. The results of our analysis for each building is summarized below.

Building #1 - Stables Building:

Snow loads were evaluated for the Building in accordance with the Building Code. The Building Code references ASCE 7-05, Minimum Design Loads for Buildings and Other Structures, as published by the American Society of Civil Engineers, as the standard to use in determining building snow loads. For North Creek the ground snow load is 70 psf. If the Building was considered by its original use of Agricultural, this results in a lower Importance Factor (Occupancy Category I) of 0.8 compared to the normal of 1.0 for most buildings. This seems reasonable since any public use such a historical tours, would be seasonal. Therefor, the building represents a low hazard to human life in the event of a failure. The “normal” occupancy is Category II for most buildings. For the sake of this report this is called a Normal Hazard Occupancy. We also assumed the building would have a new metal roof, thereby offering a slippery surface to shed snow. The roof was considered a cold roof since the building is not heated. When all the factors are taken into account the snow load on the horizontal projection of the roof would be 31 psf. We calculated the capacity of the roof rafters to be approximately 30 psf. The wall studs and columns are also sufficient to resist the snow load plus out of plane wind loads.

However, the double plate on top of the wall studs would not be able to resist the horizontal thrust reaction from the roof rafters. Since there is no sheathing on the roof to act as a diaphragm and there are no collar ties at the top of the stud wall, the double top plate must resist this load. The plate would be over-stressed by a factor of 2 to 1 for the design snow load described above. Per the Existing Building Code of New York State (Existing Building Code) this project would be considered an Alteration Level 1, since we are going to recommend replacement of the metal roof (see Conclusions and Recommendations section to follow). Per Chapter 4 of the Existing Building Code dealing with Alterations it is our interpretation that the Building would not need to meet the current requirements of the Building Code unless an unsafe condition is discovered. We did not discover any conditions which indicate the Building is unsafe for typical loading events.

Building #2 - Scales Building:

The occupancy for the Scales Building is difficult to determine. If it was to be classified as Low Hazard Occupancy the design snow load, again assuming a slippery surface for the roof would be 31 psf. If it was considered a normal hazard the snow load would be 38 psf. In addition a live load of 20 psf, as a reaction from the attic floor joists, was applied to the bottom chord of the trusses.

This provision is required for attic space without storage. The stresses in the key roof framing members as a multiple of allowable stress are summarized as follows:

Member	Low Hazard	Normal Hazard
Rafter	0.9	1.2
Iron Truss Rods	0.99	1.2
Truss Bottom Chord	3.8	4.8
Truss Horizontal Top Chord	0.7	0.9
Truss Diagonal Top Chord	3.9	4.9
Roof Purlin Under Rafter	2.3	2.8

The truss is severely over-stressed for both the Low and Normal Hazard snow loads. This is due to the geometry of the truss. Normally trusses are designed primarily as axially loaded members. However, on this truss the diagonal members are loaded axially and in bending due to the load from the roof rafters, via the purlin and post. In addition, the diagonal truss member intersects the bottom chord of the truss about 18 inches from the column support. This imposes large bending forces in the bottom chord. We investigated if the rafters would be strong enough to span from the ridge to the exterior walls, but they would be severely over-stressed for this load condition. Even if the attic floor live load is removed from the bottom chord of the truss it is still over-stressed.

There is insufficient bracing perpendicular to the truss top chord to provide the necessary restraint of these compression members. Our analysis assumes additional bracing would be added.

We believe the present roof support system, even in good condition, is insufficient and would need to be addressed if the structure is restored.

Building #3 - "T" Building:

The T Building was analyzed for snow loads assuming a Normal Building Occupancy and therefor an Importance factor of 1.0. The section of the building with new metal plate connected wood trusses was not analyzed. We would need shop drawings of these trusses to properly evaluate them. Since these trusses are relatively new, it is a reasonable assumption to assume they were designed in accordance with the Building Code snow load requirements. This building has a new roof and was thus considered a slippery surface. Like the other buildings the snow load was calculated based on a cold roof.

The results of the analysis for the trusses and rafters of the Main Building is summarized as follows:

Member	Stress Level as a Multiple of Allowable
Rafters @ Truss	1.9 (unbalanced) 0.7 (balanced)
Rafters @ Non-Truss	2.5 (balanced)
Truss Bottom Chord	0.7
Truss Diagonals	0.5
Truss Vertical Member	0.20

Unbalanced snow loads are where snow from one side of the roof is blown to the other side of the roof. This Building was probably constructed before this loading condition was a code requirement. At the non-truss locations the rafters are over-stressed because the collar tie is insufficient. This is easy to correct (see recommendation section to follow).

The wall studs were also analyzed for snow and wind loads. The wall studs would be adequate to resist the snow or wind code load looked at separately but would not be adequate for the Building Code required load combination of snow plus wind load. The studs would be over-stressed for this load combination by a factor of 2.2.

The results of the analysis for the original Addition Framing are as follows:

Member	Stress Level as a Percentage of Allowable
Rafters	2.20 (unbalanced) 1.20 (balanced)
Lower Collar Tie	0.20

The capacity of the rafters can be greatly improved by stiffening the upper collar tie. The wall studs were also analyzed for wind and snow loads. Stress levels are very similar to the Main Building.

CONCLUSIONS AND RECOMMENDATIONS

All of the buildings require some repair work to restore them to a safe condition or to prevent further deterioration of the Buildings. A general description of the conclusions of our report with recommendations for repairs for each Building are summarized below. We have also included other recommendations, which may not be required for stabilization of the Buildings, but should be considered. After each set of recommendations is listed a Repair Project Scope of Work. An Engineer's Estimate of Probable Construction Costs was completed to estimate the cost of each of these scopes. Appendix B contains the Construction Cost estimates.

Building #1 - Stables Building:

Although the Building would not meet structural loading requirements of the Building Code, it is not required to do so per the existing Building Code. We did not uncover any deficiencies which would require correcting the original structural design. There are however several items that need to be repaired to restore the Building to a safe condition. Many of the these items are also required to prevent further degradation of the Building. We believe this building needs some work, but it is feasible to repair this Building to a stable condition. We have also included a cost option to demolish the Building for comparative purposes.

Our first recommendation applies to all three buildings. Site grading is such that on all three buildings water is entering the first floor for portions of the Buildings. This is causing the bottoms of wall studs and wood posts to decay, creating the potential for structural settlement of the Building(s), and in the extreme case localized failure or collapse. This condition needs to be corrected before additional damage is done to the structure. We would recommend re-grading the site around the buildings such that water is always directed away from the buildings. We would also recommend that French Drains of crushed stone be installed at the drip line of all roofing. The French Drains would consist of about an 18"x18" section of crushed stone with filter fabric on three sides and a 4 inch perforated pipe on the bottom. The pipes would daylight to the east side of the site.

The roof of the Building is rusted and in poor condition. It makes little sense to perform significant repairs on the Building unless the metal roof is replaced. The leaks in the roof will only cause additional deterioration to the structure. Also, a new painted metal roof will significantly decrease the applied snow load on the building.

The bottoms of several posts have rot and need to be repaired. This would require temporary shoring of the loads on the post and lapping in a new section of pressure treated lumber. All sections of decayed bottom plate would also need to be replaced with pressure treated lumber. The wood floor should be selectively replaced or alternatively this area should be roped off with no public access until it can be repaired. In addition, there are several other small repair items listed in the Repair Scope of Services below. We would also recommend strengthening the double top plate at the top of the wall.

<u>Stables Building - Repair Scope of Services</u>

1. Re-grade the site around the Building and install French Drains below roof drip lines.
2. Install a new metal roof, includes replacement of decayed planks.
3. Repair column and stud bases. Install new wood plates where required.
4. Sister decayed rafters(3).
5. Fix knee brace connections.
6. Strengthen Double Plate connection.
7. Barricade off public access to wood floor areas.

We estimate the cost to implement these repairs by a Contractor would be approximately $64,000.00. This includes additional Engineering to prepare sketches of the repairs. As an alternative we estimate the cost to demolish the existing Building at $30,000.00 to $35,000.00. The cost of demolition assumes there are no hazardous materials in the Building.

<u>Building #2 - Scales Building:</u>

The Scales Building in its current condition is an unsafe structure. The roof has already partially collapsed and there are many elements of the structure which would need to be re-built to return it to a safe condition. We do not believe it is economically feasible to restore this building. Although the Building is listed on the National Historic Register, the historic content of the Building has been compromised by past work. The interior walls and ceilings have been covered with a gypsum sheathing product which hides the historical timber framing features of the Building. In our opinion this Building should be demolished.

However, if it is decided to try and save this building, we would recommend that three temporary shoring walls of 2x6 stud construction be installed under the bottom chord of the trusses. Also, the area around the brick masonry chimney must be barricaded to prevent injury due to the potential for falling brick. The temporary shoring walls would be shimmed tight to the underside of the trusses and should be placed along the north and south exterior walls and at mid-span of the Building. The walls should braced against each other with diagonal 2x6 bracing. These walls would prevent a total collapse of the structure until additional permanent stabilization work could be begin. The roof could still collapse on the attic floor. We do not believe it is safe for contractors to work in the attic in its current condition.

If it is decided to proceed to the next step of structurally restoring this Building then the Building would need to be temporarily shored so that it could be leveled. We believe that the majority of the roof structure would have to be disassembled from above, with contractors working from man-lifts and re-built. Unlike the Stables Building, which has a very direct and predictable load path, this Building transfers loads from the roof rafters to the truss below. This load path is transferred through numerous connections. Many of these connections are decayed, compromised, or have already failed. During the re-building process each of these connections would need to be evaluated and repaired appropriately. We also believe that the overstress condition in the roof system should be addressed during this work. This can easily be accomplished by sistering the rafters with a member strong enough that the snow loads will no longer be transferred to the truss. The Repair Scope of Services to perform this work, along with other items necessary to return the Building to a safe condition are listed below:

<u>Scales Building - Repair Scope of Services:</u>

1. Erect temporary wall shoring as described above.
2. Remove all failed and unstable roof construction from man-lifts.
3. Using scaffold shoring or other means, jack and level the remaining structure.
4. Replace all decayed sections of wood posts, wood studs and the wood plate with new pressure treated lumber. It can be anticipated that at least 70% of the perimeter studs, columns, and plates are affected.
5. Rebuild the roof trusses and rafter framing. In some locations the entire wood column may need to be replaced. This is true of at least the one column at the north side of the failed truss. A majority of the connections will need to be repaired. If the Historical content of the structure is to be preserved then this will require mortise and tenon joinery in several locations. This will also require the installation of additional truss top chord bracing, beyond the original construction. We do not believe the top chord of these trusses was ever sufficiently braced. Sister the existing roof rafters with an appropriate sized member. This work would have to be coordinated with the historic requirements for the structure.
6. Remove all unstable masonry from the chimney and re-build the chimney.
7. Install new planking on top of the rafters and install a new metal roof.
8. Remove all interior wall and ceiling coverings. This will eliminate any live loading requirement for attics, decreasing the load on the trusses. This will also return the Building to its original construction.
9. Repair the foundation wall at the south-east corner.
10. Repair the scale pit enclosure roof structure and walls. Install new metal roofing on the enclosure.
11. Re-grade the site around the Building and install French Drains below roof drip lines.

We estimate the cost to demolish the Building at $30,000.00 to $40,000.00, assuming no hazardous materials are present. We estimate the cost to implement the above Repair Scope of Services at $150,000.00. This estimate is approximate and could vary greatly depending on the Contractor’s approach and his assessment of how much temporary shoring and jacking would be required. The final cost would also be influenced by the extent to which the original historic features would need to be maintained.

<u>Building #3 - T-Building:</u>

The T-Building is in the best condition of the three buildings. Like the other Buildings, it would not meet the loading requirements of the Building Code, but it is not required to do so per the Existing Building Code. We did not uncover any obvious unsafe loading conditions, although there are a few items which should be addressed. The most important item, as discussed before, is to improve the drainage around the Building.

There are several items, which are not critical at this time but should be considered to improve the long term performance of this Building. Based on the water intrusion into the building some of the wood plates below the studs may have some decay. A thorough check of these wall plates should be performed and any sections which are decayed should be replaced. If wall plates are replaced under a truss, a temporary shoring post would need to be placed under the affected truss. The Repair Scope and cost estimate includes an allowance for this item. It could not be determined if the lower wall plate is anchored to the foundation. Due to height of these walls, proper anchorage is critical. Some selective plate removal should take place to determining the anchoring. If anchoring is insufficient, then post installed chemical or expansion type anchors can be easily installed. A minimum of one ½" diameter anchor bolt at no more than 48 inches part should be present.

The capacity of the roof rafters can be greatly improved by stiffening the upper collar tie in both the Main and Addition Buildings. The unbraced length of this member is currently to long to be able to resist the compression forces it would be subjected to. The unbraced length can be easily reduced by nailing lengths of 2x6 perpendicular to the collar ties.

We would also recommend the installation of some plywood sheathing on the inside face of some of the exterior walls. This will create some shear walls to resist wind forces and possible racking of the Building. The Building walls are quite tall and this would improve the long term performance of the Building and allow it to resist higher wind load events.

We estimate the cost to do grading improvements and install the French Drains only, at $10,000.00. We estimate the cost to implement the other items (See Appendix B for a breakdown of these costs) described above at approximately $16,000.00. Most of these items could be performed by Town employees, greatly reducing the costs.

<u>T-BUILDING YEAR ROUND FEASIBILITY ANALYSIS</u>

As part of this report we were also requested to investigate the feasibility of converting the T-Building to year round public use. It is anticipated that the Building would be used as a Community Hall, Exhibition Hall or similar public uses. Per the Building Code of New York State this would be considered an A-3 Assembly Occupancy. In our opinion, the present use of the facility would be Occupancy S-1, or Moderate Hazard Storage. Per Chapter 9 of the Existing Building Code, this change in Occupancy would be an increase in hazard and the Building would need to comply with most requirements of the Building Code for new structures. A building code analysis of the key items are summarized below:

- Occupancy A-3
- Type of Construction - 5B
- Allowable Fire Area - 6000 s.f   Actual Area - 4500 s.f.
- Number of Occupants at 15 s.f. per Occupant - 300
- Number of legal exits required - 2
- Maximum travel path to legal exit - 75 feet

- Per Section 903 of Fire Code if the number of Occupants exceeds 100 an automatic sprinkler system is required.
- Exit Signs and Exit Lights with battery back-up would need to be installed.

In order to avoid the installation of a sprinkler system the code Official would have to agree to a posting limit of 100 occupants for the Building. Assuming this could be done the following plumbing improvements would be required:

- Separate women's and men's bathroom facilities with one water closet and one lavatory in each.
- One Drinking water fountain.
- One Service Sink
- Each bathroom facility to be ADA compliant.
- If public sewer facilities are not available, then a new on site waste water disposal system would required.
- If public water is not available, then a new well may be required.

A heating system would need to be installed per Building Code requirements. The current electrical service is a 200 amp 120/240 volt service. Depending on the heating system and other amenities, this may need to be upgraded. The Building would need to be insulated. This creates an issue with the present siding system. The siding is currently installed directly to the wall studs without sheathing or a moisture barrier. If the walls are insulated any moisture penetrating the siding would get into the insulation causing the formation of mold and accelerate the decay of the wood studs. We would recommend removal of the existing siding, installing plywood sheathing to the wall and a moisture barrier before re-installing the siding. The interior face of the walls would need to be covered with gypsum sheathing to contain the insulation and protect electrical wiring. Without removing the new roof, the only place to effectively insulate the ceiling is at the bottom of truss or ceiling joist elevation. This would require the installation of a gypsum board ceiling and affect the structural requirements (see below).

Per Chapter 9 of the Existing Building Code the Building would need to meet the seismic requirements of the Building Code unless the Code official determines that the seismic upgrade would damage the historic features of the building. We doubt this waiver would be granted since the other changes to the Building described above would be more intrusive than the structural upgrades. Other structural requirements would be:

- Installation of additional anchors of the wall to the foundation to meet wind and seismic loads.
- Ceiling Joists and additional truss members will need to be installed to support the new insulation and gypsum board ceiling. At this time the roof rafters should be reinforced to meet the Building Code Snow load requirements. The bottom chord of the existing joists may need to be reinforced for an attic live load of 10 psf.
- The new plywood sheathing attached to the outside of the wall, as described above, would be used to meet any additional shear wall requirements.

An investigation of other insulating systems may be appropriate to avoid some of the work described above. These investigations are beyond the scope of this report and would requiring hiring an Architect or expert in this field. The work required to convert this Building to year round public use would be extensive. The preparation of a Construction estimate to perform this work is beyond the scope of this report, but a budget figure of $80.00 to $100.00 per square foot would not be unreasonable. This would result in a construction cost of as much as $450,000.00. If the Town is serious about this option, we would recommend that a more thorough study be performed to investigate different alternatives and to prepare an accurate cost estimate of the work to be performed.

If you require assistance for the detailed structural design of any of the items noted above we will be glad to assist you in this effort. Thank you for the opportunity to provide these structural engineering services. If you have any questions regarding this report please call Shaun Rivers at 761-0417, Ext.3.

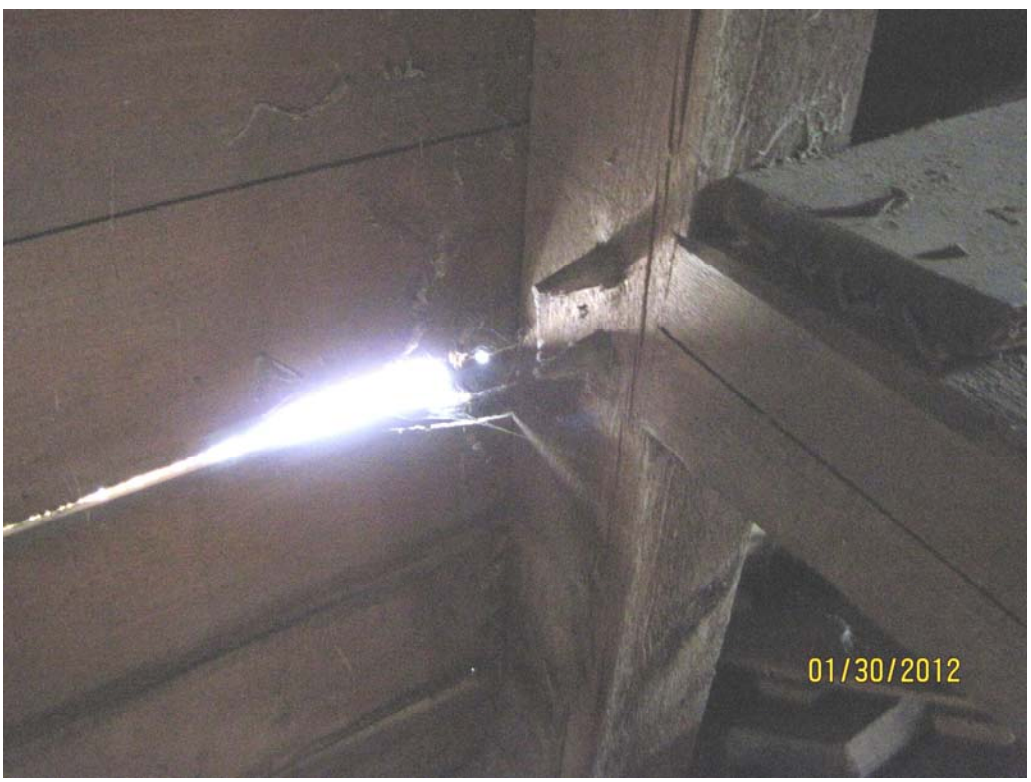
APPENDIX A

Photographs

Photograph 1 – South Elevation of Stables Building

Photograph 2 – Stables Typ. Rafter at Ridge

Photograph 3 – Stables Typ. Tie Beam and Upper Wall Construction



Photograph 4 – Stables Mortise and Tenon Joint at Tie Beam

Photograph 5 – Stables Loft Floor Joist Construction

Photograph 6 – Stables Bearing of Loft Floor Joist on Wall Plate

Photograph 7 – Stables Stone Foundation

Photograph 8 – Stables Transition of Wood Floor to Concrete Slab

Photograph 9 – Stables Decayed Portion of Roof Rafter

Photograph 10 – Stables Knee Brace Has Pulled Away From Tie Beam

Photograph 11 – Stables Decayed Post Base

Photograph 12 – Scales Building North Side with Roof Collapse, Note Sag in Siding on Left Side of Picture.

Photograph 13 – Scales Building – South Side, Note Dip in Ridge

Photograph 14 – Scales Building Rafters with Hoist Beam Tied to Collar Tie

Photograph 15 – Scales Bldg. Truss Framing, Failed Truss on Left

Photograph 16 – Scales Bldg. - Purlin Support of Rafter Pulled Away From Truss

Photograph 17 – Scales Bldg. – Failed Bearing End of Truss

Photograph 18 – Scales Bldg. – Rotten Truss to Column Connection

Photograph 19 – Scales Bldg. – Decayed Siding and Bottom Wall Plate

Photograph 20 – Scales Bldg. – Decayed Wall Plate and Post Base

Photograph 21 – Scales Bldg. – Scale Pit Mechanism Bearing on Concrete Pier

Photograph 22 – Scales Bldg. – Fairbanks Scale Insignia

Photograph 23 – Scales Bldg. – Scale Pit Flooring w/ Enclosure Support Wall on Right

Photograph 24 – Scales Bldg. – Scale Pit Enclosure w/ Split Rafter and Decayed Planks

Photograph 25 – Scales Bldg. – Cracks in Brick Masonry Chimney

Photograph 26 – “T” Building – West Elevation, Note Height of Outside Grade Elevation

Photograph 27 – “T” Building – East Elevation with Addition in Background

Photograph 28 – “T” Building – Main Building Rafter and Truss Framing

Photograph 29 – “T” Building – Ice on Concrete Floor Slab

Photograph 30 – “T” Building – Original Roof Framing in Addition

Photograph 31 – “T” Building – Bottom of Floor Framing in Addition

Photograph 32 – “T” Building – New Truss Framing in Addition

Photograph 33 – “T” Building – Connection of Addition Roof Framing to Main Building

APPENDIX B

Wood Species Letter
Construction Cost Estimates

ESF

State University of New York
College of Environmental Science and Forestry

Department of Sustainable Construction Management and Engineering

February 29, 2012

Shaun M. Rivers, P.E.
Schoder Rivers Associates
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, NY 12804

Dear Shaun,

I examined the six wood samples that you sent for species identification from the North Creek Train Station, Job No. 11-401. The samples were identified using microscopic features with the following results:

1	Stable Truss	Spruce, Picea spp.
2	Stable Rafter	Balsam Fir, Abies balsamea
3	Garage Truss	Spruce, Picea spp.
4	Garage Col.	Spruce, Picea spp.
5	T-building Truss	Spruce, Picea spp.
6	T-building addition rafter	Spruce, Picea spp.

Please contact me if you have any questions.

Best Regards,

Susan E Anagnost

Susan E. Anagnost, Ph.D.
Chair and Associate Professor, Dept. of SCME
Director, N.C. Brown Center for Ultrastructure Studies

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Project:	North Creek Train Station Complex	Job No.:	11-401
Location:	Stables Building	Date:	4/18/12
Client:	Town of Johnsburg	By:	SMR

Item	Description	Unit	No. Units	Unit Cost	Cost
1	Regrade site				
a.	Equipment rental	wk.	1	$1,200.00	$1,200.00
b.	Operator	mh	32	$60.00	$1,920.00
c.	Laborer	mh	80	$42.00	$3,360.00
d.	stone	cy	15	$35.00	$525.00
e.	Misc. Materials	ls	1	$200.00	$200.00
	Subtotal				$7,205.00
2	New Roof				
a.	Roofing	sf	1700	$5.00	$8,500.00
b.	Staging/fall protection	ls	1	$2,000.00	$2,000.00
c.	Replace rotten planks	mh	40	$50.00	$2,000.00
d.	misc. materials and disposal fees	ls	1	$700.00	$700.00
e.	Remove old roof	mh	40	$42.00	$1,680.00
	Subtotal				$14,880.00
3	Wood Repairs				
a.	Shoring Scaffold Rental	month	1	$800.00	$800.00
b.	Install Shoring	mh	72	$50.00	$3,600.00
c.	Repair posts and studs/plates	mh	160	$50.00	$8,000.00
d.	Replace bad rafters	mh	16	$50.00	$800.00
e.	Fix Knee Brace connections	mh	16	$50.00	$800.00
f.	Brace double plate connection	mh	24	$50.00	$1,200.00
g	Barricade wood floor areas	mh	16	$45.00	$720.00
h	Materials	ls	1	$1,000.00	$1,000.00
	Subtotal				$16,920.00
4	Subtotal Items 1 -3				$39,005.00
5	Supervision	mh	200	$60.00	$12,000.00
6	Mobilzation/Demobilzation	ls	1	$2,000.00	$2,000.00
7	Subtotal				$53,005.00
8	GC O.H. and Profit (15%)				$7,950.75
9	Total Contractor Cost				$60,955.75
10	Engineering	ls	1	$3,000.00	$3,000.00
11	**Total Project Cost**				**$63,955.75**

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Project:	North Creek Train Station Complex	Job No.:	11-401
Location:	Scales Building Sheet 1	Date:	4/18/12
Client:	Town of Johnsburg	By:	SMR

Item	Description	Unit	No. Units	Unit Cost	Cost
1	Erect temporary shoring				
a.	Materials	ls	1	$1,000.00	$1,000.00
b.	Labor	mh	120	$50.00	$6,000.00
	Subtotal				$7,000.00
2	Remove Unstable Roof				
a.	Equipment Rental (incl. repairs)	month	1	$3,000.00	$3,000.00
b.	Labor	mh	80	$50.00	$4,000.00
c.	Misc. Materials	ls	1	$300.00	$300.00
	Subtotal				$7,300.00
3	Shore and Jack Structure				
a.	Scaffold Rental	month	1	$1,200.00	$1,200.00
b.	Labor	mh	120	$50.00	$6,000.00
c.	Misc. Materials	ls	1	$500.00	$500.00
	Subtotal				$7,700.00
4	Wood Repairs				
a.	Rebuild Post/stud/plates	mh	160	$50.00	$8,000.00
b.	Rebuild rafters and trusses	mh	360	$50.00	$18,000.00
c.	Remove old interior sheathing	mh	32	$42.00	$1,344.00
d.	Disposal fees	ls	1	$1,000.00	$1,000.00
e.	Materials	ls	1	$3,000.00	$3,000.00
f.	New truss bracing	mh	40	$50.00	$2,000.00
g.	Reinforce rafters	mh	64	$50.00	$3,200.00
	Subtotal				$36,544.00
5	New Roof				
a.	Roofing (Includes Pit canopy)	sf	1850	$5.00	$9,250.00
b.	Staging/fall protection	ls	1	$2,000.00	$2,000.00
c.	Replace rotten planks	mh	80	$50.00	$4,000.00
d.	misc. materials and disposal fees	ls	1	$300.00	$300.00
e.	Remove old roof	mh	20	$42.00	$840.00
	Subtotal				$16,390.00
6	Regrade site				
a.	Equipment rental	wk.	1	$1,200.00	$1,200.00
b.	Operator	mh	32	$60.00	$1,920.00
c.	Laborer	mh	64	$42.00	$2,688.00
d.	stone	cy	12	$35.00	$420.00
e.	Misc. Materials	ls	1	$200.00	$200.00
	Subtotal				$6,428.00
	Subtotal Sheet 1				$81,362.00

ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Project: North Creek Train Station Complex — Job No.: 11-401
Location: Scales Building Sheet 2 — Date: 4/18/12
Client: Town of Johnsburg — By: SMR

Item	Description	Unit	No. Units	Unit Cost	Cost
	Total Sheet 1				$81,362.00
8	ReBuild Chimney				
a.	Erect Scaffold	mh	16	$42.00	$672.00
b.	Scaffold Rental	week	2	$300.00	$600.00
c.	Remove cracked brick	mh	24	$42.00	$1,008.00
d.	Re-build chimney repalce brick	mh	64	$55.00	$3,520.00
e.	Materials	ls	1	$1,000.00	$1,000.00
	Subtotal				$6,800.00
9	Foundation Repairs				
a.	Mason Labor	mh	32	$55.00	$1,760.00
b.	Laborer	mh	32	$42.00	$1,344.00
c.	Materials	ls	1	$1,500.00	$1,500.00
	Subtotal				$4,604.00
10	Repair Scale Pit Enclosure				
a.	Install New rafters	mh	32	$50.00	$1,600.00
b.	Instal/Sister Studs	mh	24	$50.00	$1,200.00
c.	Materials	ls	1	$1,000.00	$1,000.00
	Subtotal				$3,800.00
9	Subtotal Items 1 - 9				$96,566.00
10	Supervision	mh	320	$60.00	$19,200.00
11	Mobilzation/Demobilzation	ls	1	$2,000.00	$2,000.00
12	Subtotal				$117,766.00
13	GC O.H. and Profit (15%)				$17,664.90
14	Total Contractor Cost				$135,430.90
15	Engineering	ls	1	$10,000.00	$10,000.00
16	**Total Project Cost**				**$145,430.90**

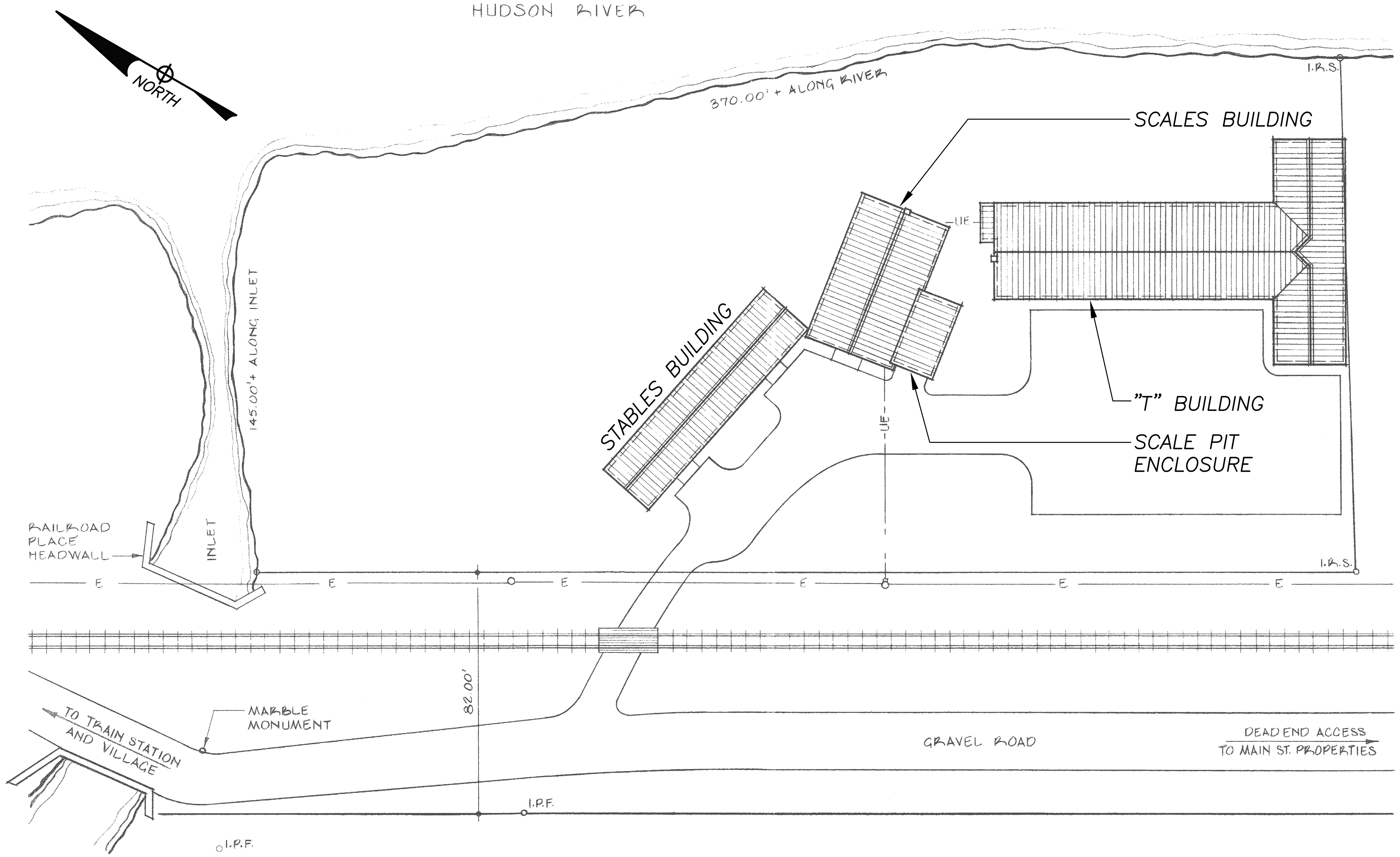
ENGINEER'S ESTIMATE OF PROBABLE CONSTRUCTION COSTS

Project:	North Creek Train Station Complex	Job No.:	11-401
Location:	"T" Building	Date:	4/18/12
Client:	Town of Johnsburg	By:	SMR

Item	Description	Unit	No. Units	Unit Cost	Cost
1	Regrade site				
a.	Equipment rental	wk.	1	$1,200.00	$1,200.00
b.	Operator	mh	40	$60.00	$2,400.00
c.	Laborer	mh	80	$42.00	$3,360.00
d.	stone	cy	26	$35.00	$910.00
e.	Misc. Materials	ls	1	$200.00	$200.00
	Subtotal				$8,070.00
2	Misc. Wood Repairs				
a.	Replace rotten wall plates	mh	72	$50.00	$3,600.00
b.	Add plywood sheathing panels	mh	32	$50.00	$1,600.00
c.	Add wall plate anchors	mh	32	$50.00	$1,600.00
d.	Misc. Materials	ls	1	$500.00	$500.00
e.	Stiffen Collar ties	mh	24	$50.00	$1,200.00
	Subtotal				$8,500.00
5	Supervision	mh	60	$60.00	$3,600.00
6	Mobilzation/Demobilzation	ls	1	$500.00	$500.00
7	Subtotal				$20,670.00
8	GC O.H. and Profit (15%)				$3,100.50
9	Total Contractor Cost				$23,770.50
10	Engineering	ls	1	$1,000.00	$1,000.00
11	**Total Project Cost**				**$24,770.50**

APPENDIX C

Sketch Drawings



SCHODER RIVERS ASSOCIATES
Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

SCALE:	N.T.S.	DRAWN BY:	JNI
DATE:	4/17/12	ENG. BY:	SMR
PROJ. NO:	11-401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK
TRAIN STATION COMPLEX

DRAWING TITLE
SITE PLAN

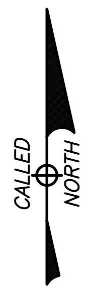
REVISIONS

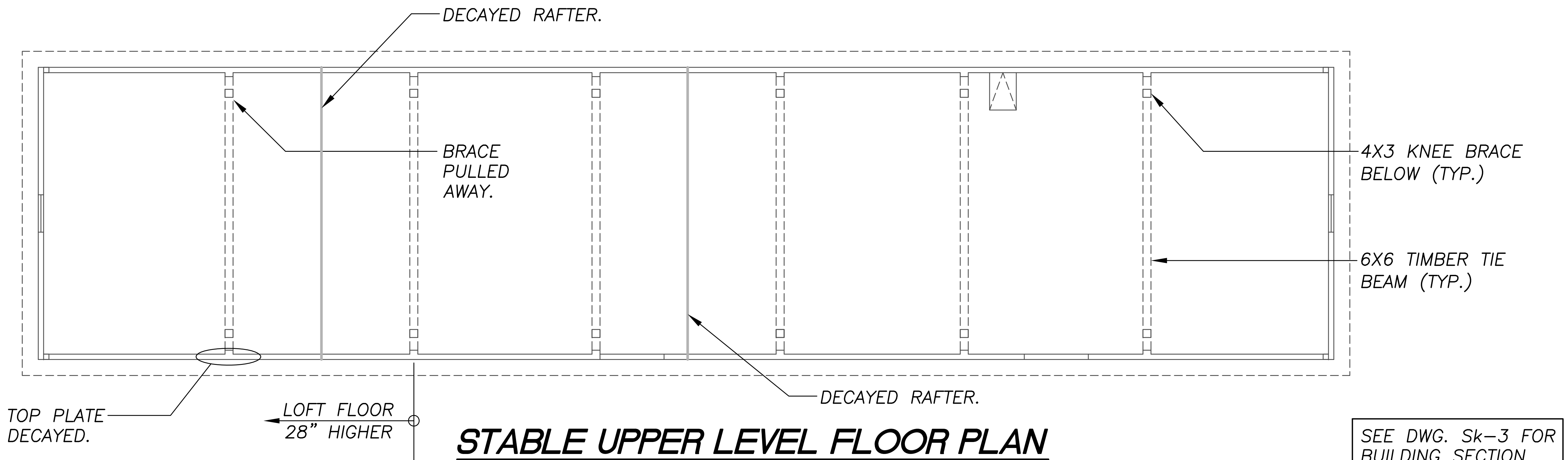
REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO.
Sk-1

SHT. 1 OF 8

REV. 0

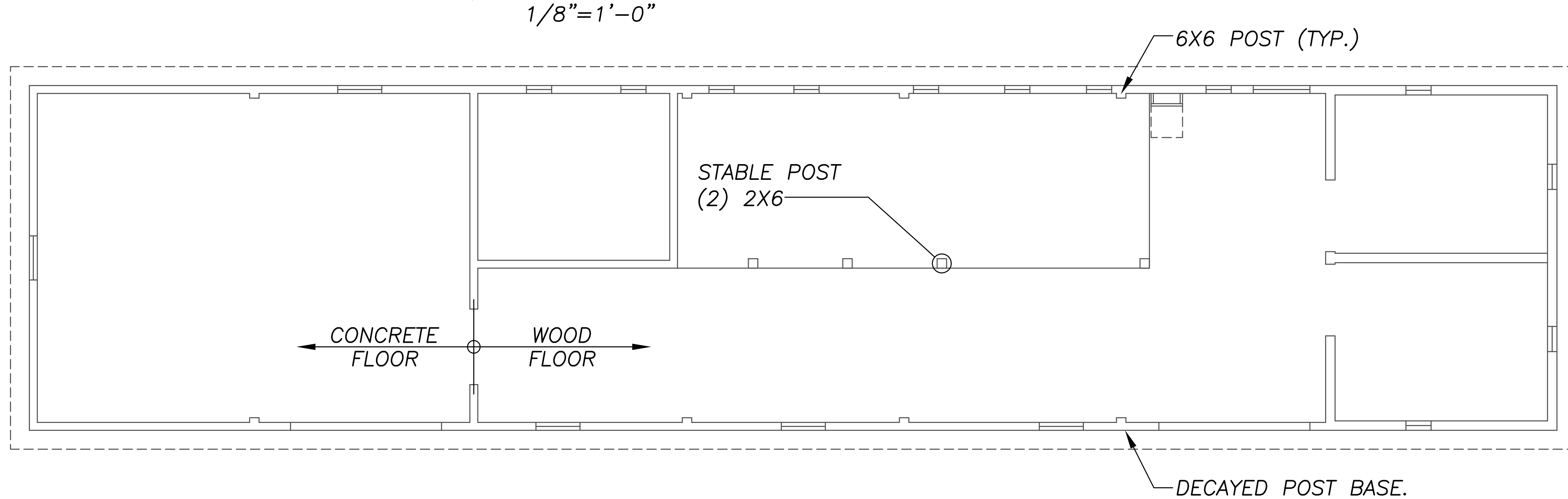




STABLE UPPER LEVEL FLOOR PLAN

1/8"=1'-0"

SEE DWG. Sk-3 FOR BUILDING SECTION.



STABLE MAIN LEVEL FLOOR PLAN

1/8"=1'-0"

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Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

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CLIENT NAME
NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE
STABLE BUILDING – PLANS

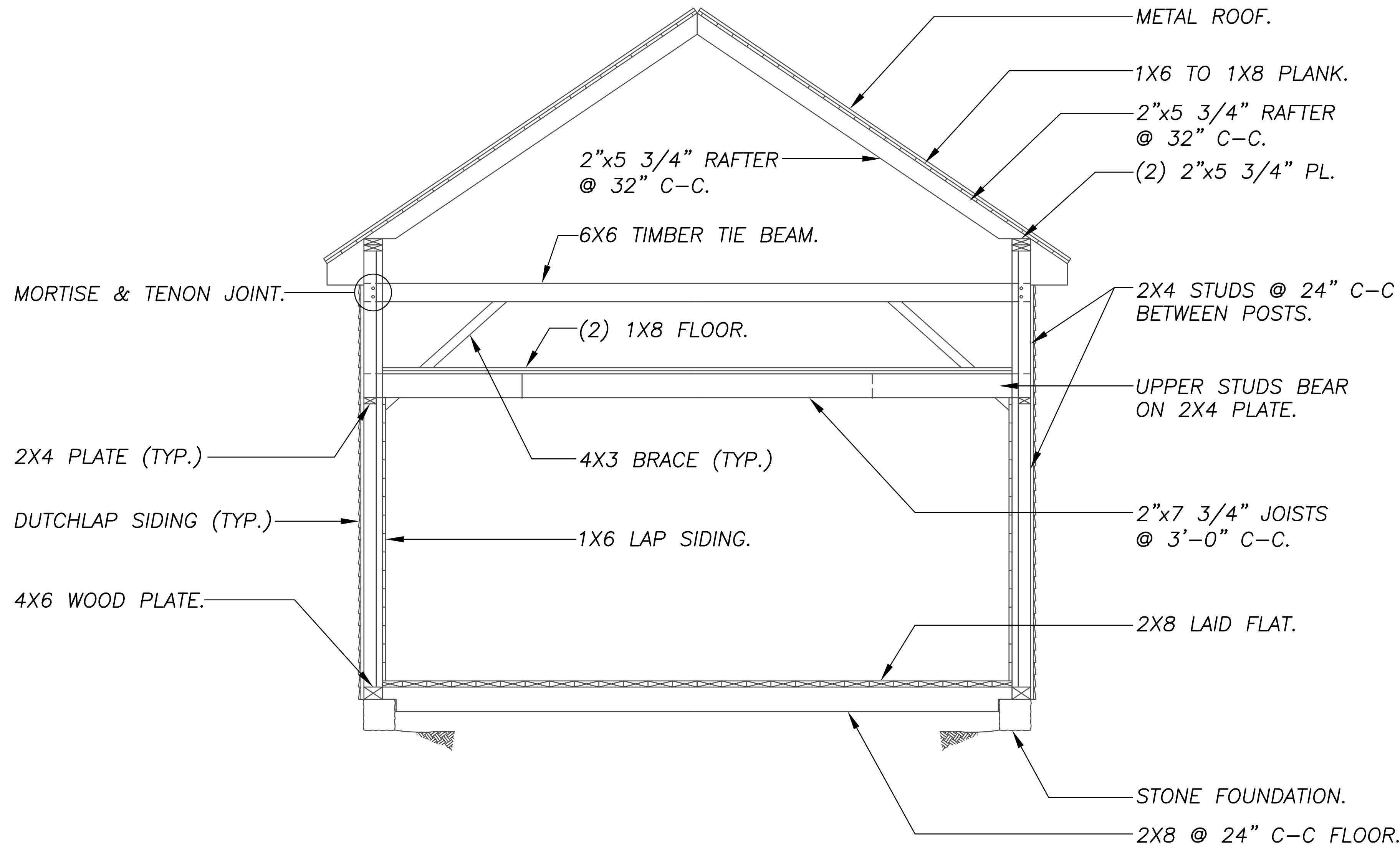
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO. Sk-2

SHT. 2 OF 8

REV. 0



STABLES CROSS SECTION

1/4"=1'–0"

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Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

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PROJ. NO:	11–401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE
STABLE BUILDING – SECTION

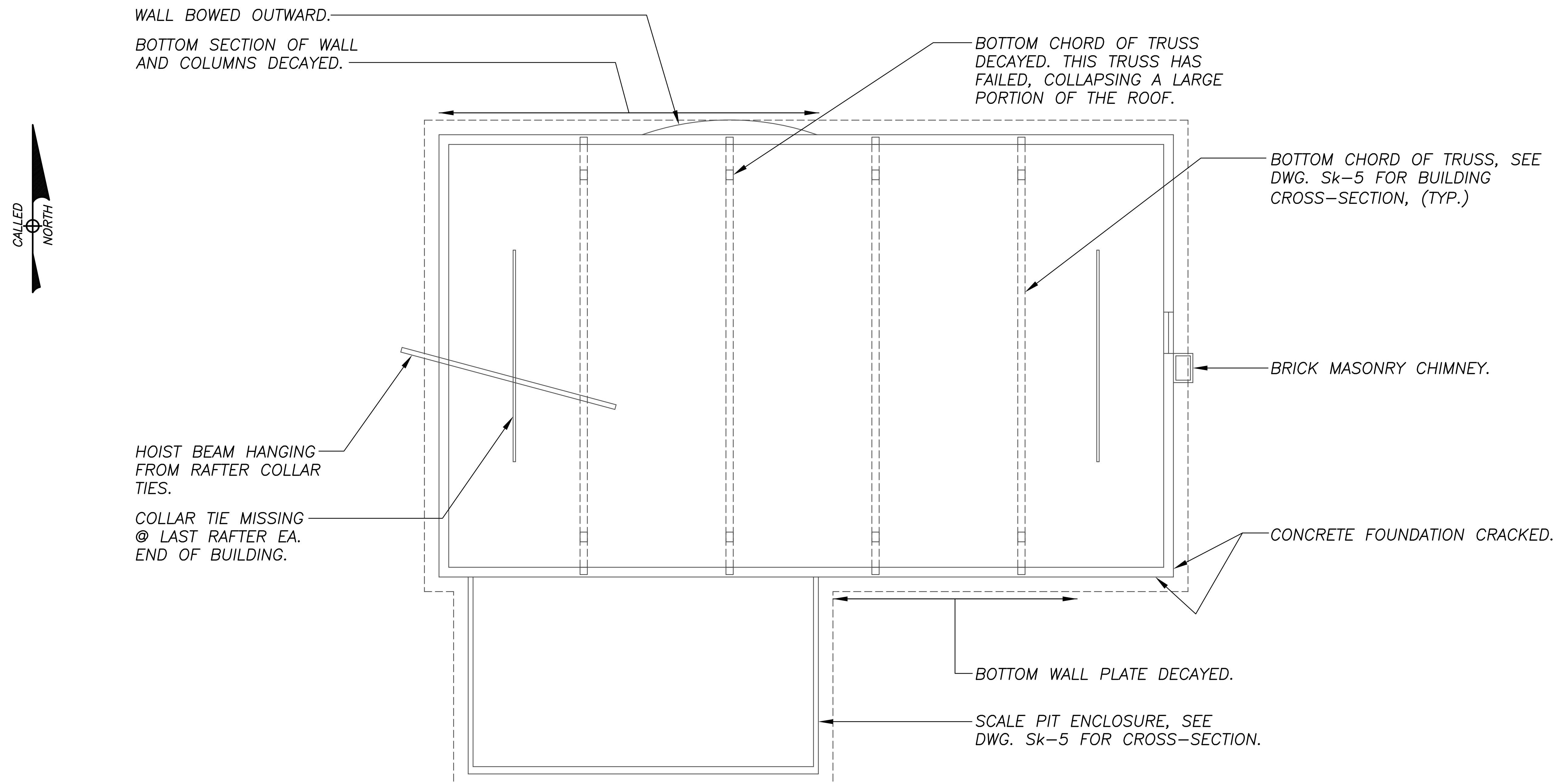
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO. Sk–3

SHT. 3 OF 8

REV. 0



SCALES BUILDING UPPER LEVEL FLOOR PLAN

1/8"=1'-0"

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Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
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SCALE:	N.T.S.	DRAWN BY:	JNI
DATE:	4/17/12	ENG. BY:	SMR
PROJ. NO:	11-401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE
SCALES BUILDING – PLAN

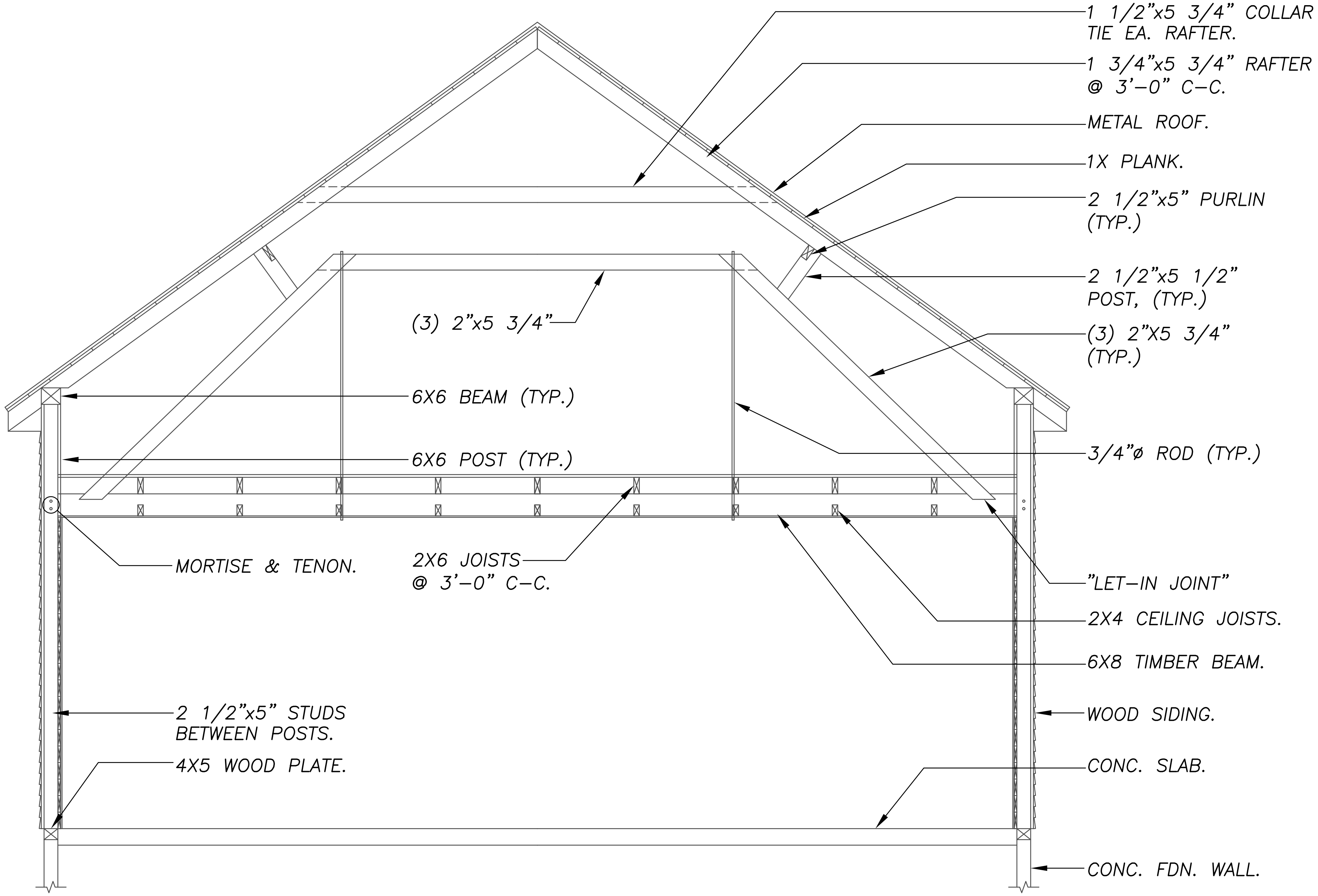
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

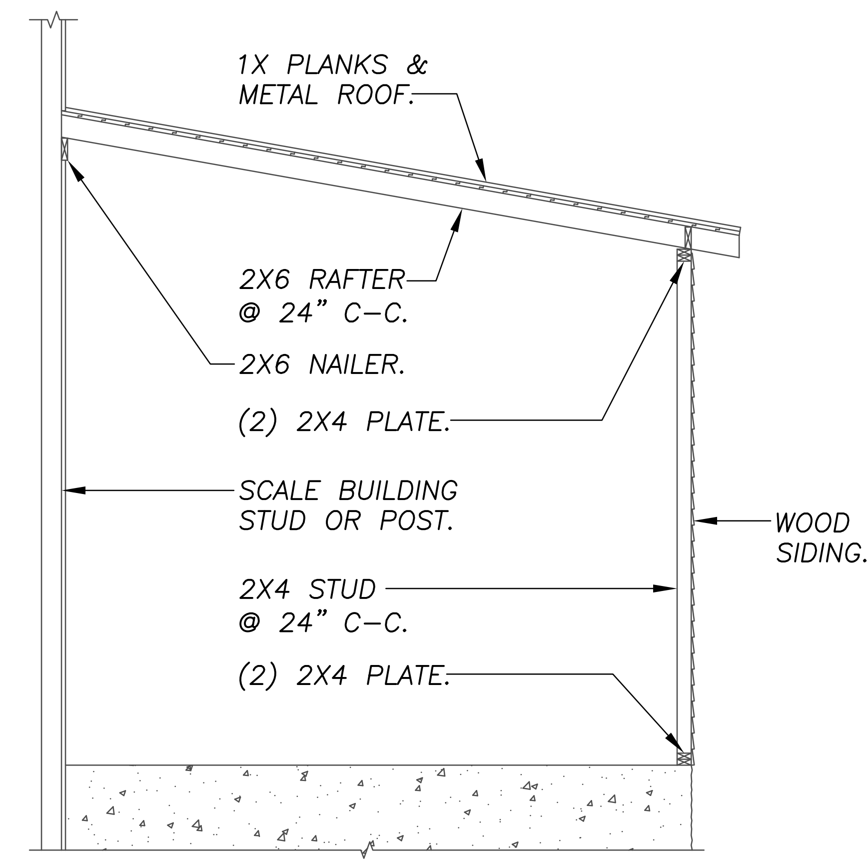
DRAWING NO. Sk-4

SHT. 4 OF 8

REV. 0



BUILDING CROSS SECTION
1/4"=1'-0"



SCALES PIT ENCLOSURE CROSS SECTION
1/4"=1'-0"

SR SCHODER RIVERS ASSOCIATES
Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

SCALE:	N.T.S.	DRAWN BY:	JNI
DATE:	4/17/12	ENG. BY:	SMR
PROJ. NO:	11-401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK
TRAIN STATION COMPLEX

DRAWING TITLE
SCALE BUILDING – SECTIONS

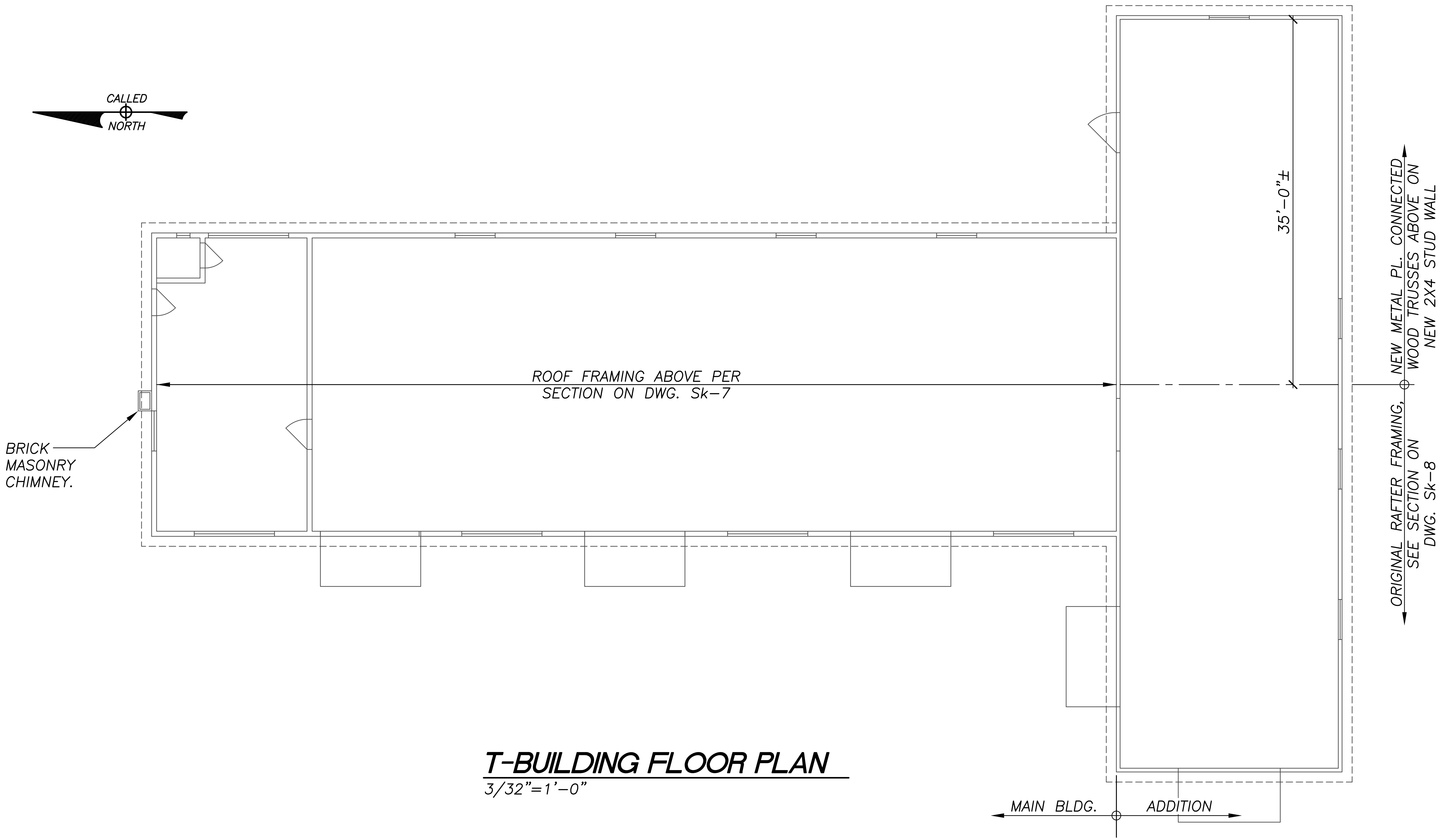
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO.
Sk-5

SHT. 5 OF 8

REV. 0



T-BUILDING FLOOR PLAN

3/32"=1'–0"

SCHODER RIVERS ASSOCIATES
Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

SCALE:	N.T.S.	DRAWN BY:	JNI
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PROJ. NO:	11–401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE
T–BUILDING

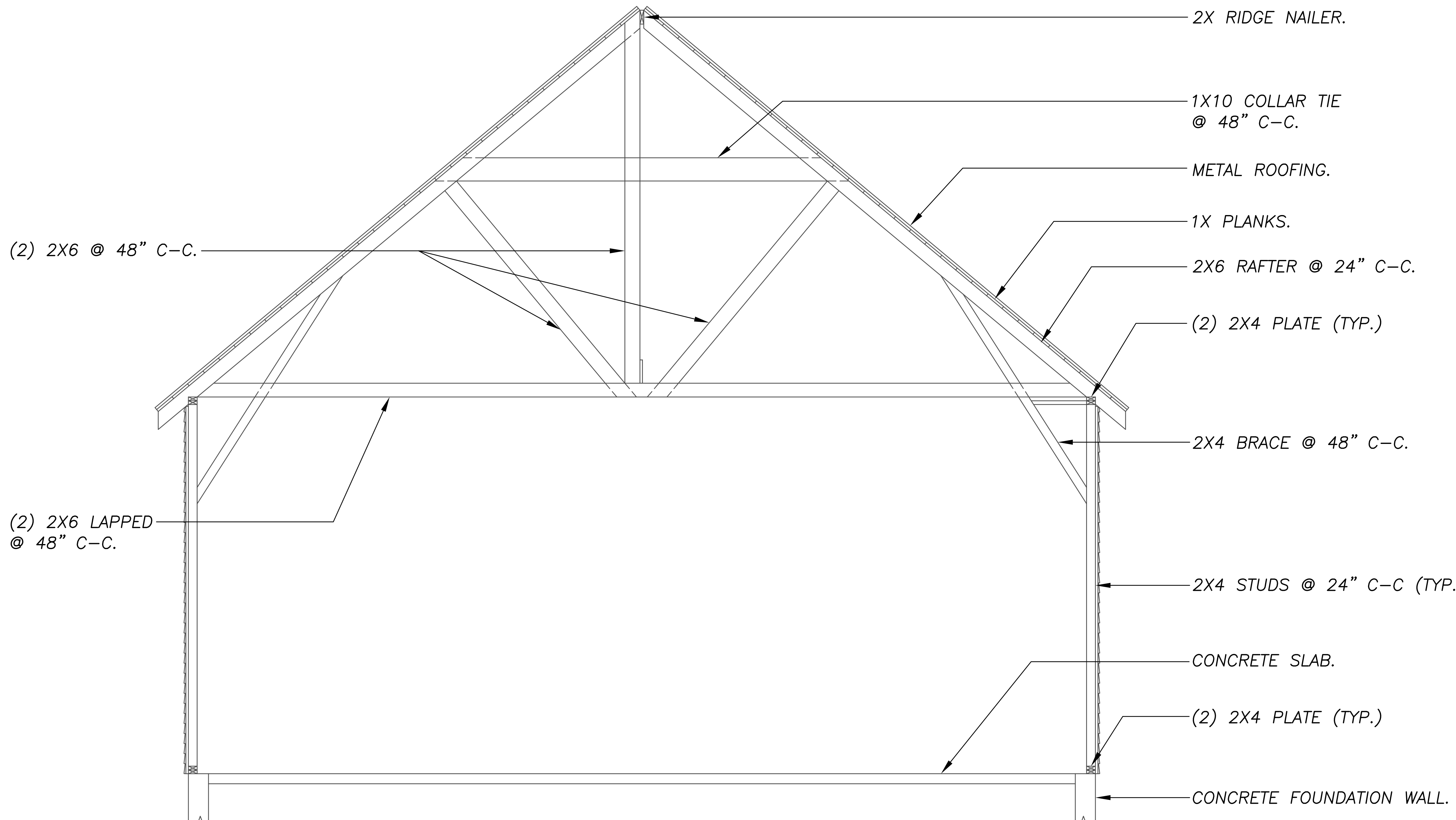
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO. Sk–6

SHT. 6 OF 8

REV. 0



"T"-BUILDING CROSS SECTION

1/4"=1'-0"

SCHODER RIVERS ASSOCIATES
Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

SCALE:	N.T.S.	DRAWN BY:	JNI
DATE:	4/17/12	ENG. BY:	SMR
PROJ. NO:	11-401	CHK'D BY:	SMR

CLIENT NAME

NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE

T-BUILDING MAIN BUILDING SECTION

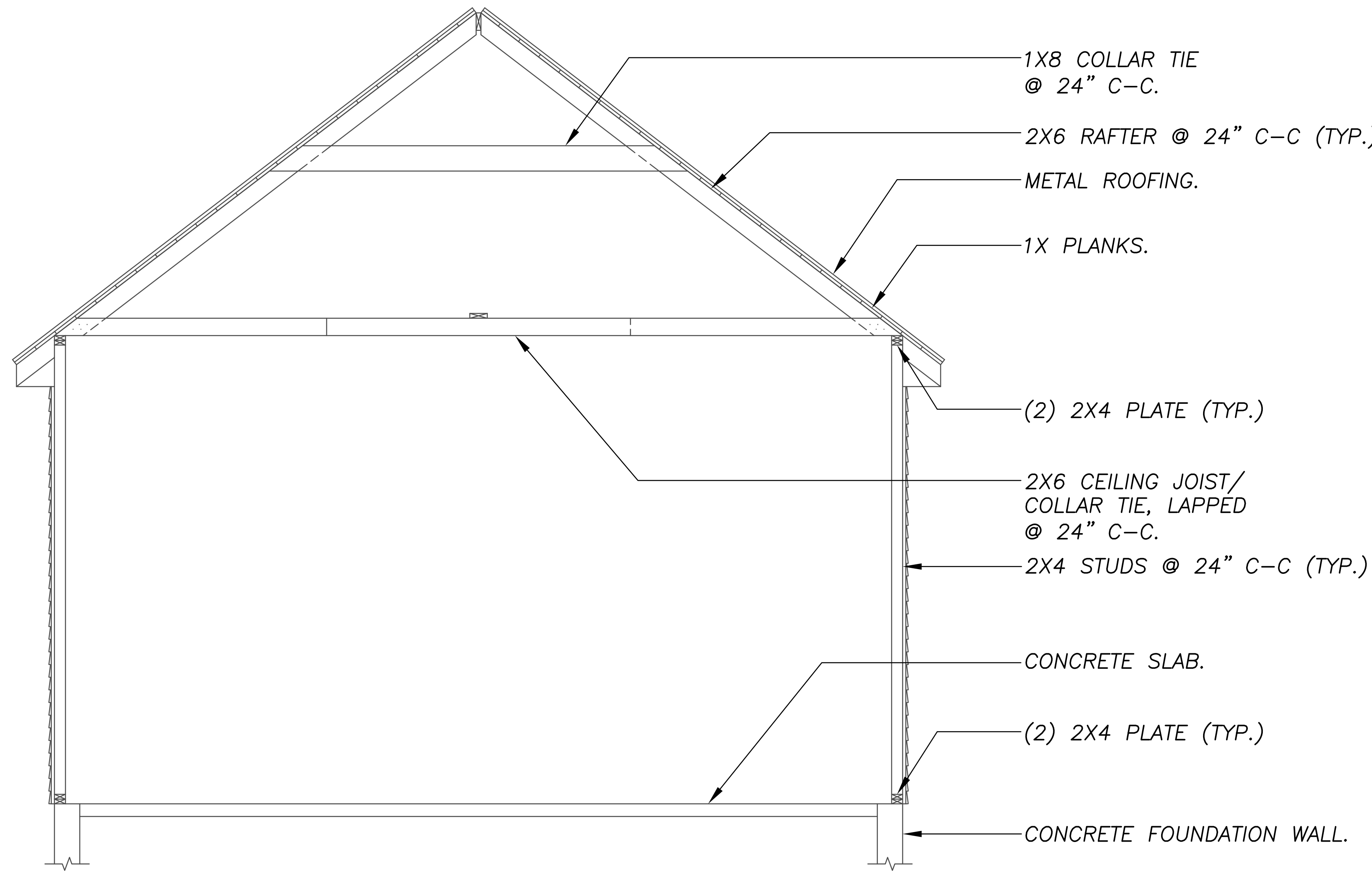
REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO. Sk-7

SHT. 7 OF 8

REV. 0



"T"-BUILDING ADDITION SECTION

1/4"=1'-0"

SCHODER RIVERS ASSOCIATES
Consulting Engineers, P.C.
Evergreen Professional Park
453 Dixon Road, Suite 7, Bldg. 3
Queensbury, New York 12804
(518) 761-0417, FAX: (518) 761-0513

SCALE:	N.T.S.	DRAWN BY:	JNI
DATE:	4/17/12	ENG. BY:	SMR
PROJ. NO:	11-401	CHK'D BY:	SMR

CLIENT NAME
NORTH CREEK TRAIN STATION COMPLEX

DRAWING TITLE
T-BUILDING ADDITION SECTION

REVISIONS

REV.	DATE	DESCRIPTION
0	4/19/12	ISSUED FOR REPORT

DRAWING NO. Sk-8

SHT. 8 OF 8

REV. 0