STRUCTURAL REVIEW OF SQUAMISH-LILLOOET REGIONAL DISTRICT OFFICE, BUILDING, 1350 ASTER ST., PEMBERTON, BC

EXECUTIVE SUMMARY

May 28, 2015

Prepared for:

Squamish-Lillooet Regional District & Village of Pemberton

Prepared by:
Fromme Engineering Ltd.
P.O. Box 2600, Squamish, BC
V8B 0B7
Tel: (604) 815-0858

Terms of Reference:

At the request of the Squamish-Lillooet Regional District (SLRD), Fromme Engineering Ltd has prepared the following Structural Review of the SLRD Office Building located at 1350 Aster St. Pemberton, BC. The purpose of this review is to give an evaluation of any structural issues present in the existing building. In addition, this review is focused upon concerns, brought forward by SLRD management: (refer to body of report for a detailed list). Further to the original report scope, two options have been identified and order of magnitude cost estimates have been provided. The two possible options are:

Option #1 – Retain the Fire Rescue occupancy at the ground floor and renovate the existing building to meet the Post Disaster Importance Category.

Option #2 – Relocate the Fire Rescue occupancy at the ground floor and renovate the existing building to meet the Normal Importance Category.

Extent of evaluation:

- Existing architectural/structural documents of a portion of the building were reviewed. Note: very limited existing drawings.
- A visual inspection of the structure was carried out.
- Design calculations were performed based on the design loads determined in accordance with the 2012 BC Building Code and the climatic data specified by the SLRD.
- A list of potential upgrade recommendations was developed, which primarily focus upon the concerns brought forward by the SLRD.

Standards of Evaluation:

The following codes and procedures were used in the review of this structure:

- BC Building Code 2012.
- Climatic data (2014) Squamish-Lillooet Regional District.
- CSA - 0861 and CAN/CSA 08651Wood Frame design/work.
- CSA- A23.3 Concrete design/work.
- CAN/CSA-S16.1 and CAN/CSA-S16 S1 Steel design/work.
- CAN 3-S304.1 Masonry design/work.

Evaluation:

- The existing structure is very vulnerable to damage from both flooding/debris flows and seismic loads, however our evaluation was focused upon seismic lateral loading, with the understanding that flood/debris flow loading would be design checked as required.
- Existing structure has been evaluated as an emergency response facility with post-disaster importance category.
- The existing structure lacks positive connection between the roof and floor diaphragms and lateral load resisting elements (shear walls, both wood and concrete block).
- Many existing structural elements (when evaluated with current 2012 BC Building Code and climatic loading) are found to be either marginal or under capacity.
- The building lacks a positive lateral load resisting system at the north side ground floor. In addition, the building has suffered foundation settlement damage in the same location.

Recommendations:

The following recommendations are made in response to the previously stated terms of reference questions posed by SLRD management. In addition, any further pertinent recommendations made by our firm follow respectively:

- The existing foundations would potentially require some significant retro fitting along the north building elevation. The extent of modification is dependent upon possible future renovation/expansion scope.
- New foundations would be required for possible expansion of building off S-E corner. Also, possible foundation reinforcing may be required at existing annex, again dependent upon the possible future renovation/expansion scope.
- Fairly extensive retro-fitting would be required to bring the existing building into structural compliance with the 2012 BC Building Code. Note: the classification of the building as an emergency response facility requires higher loads and enhanced seismic design and detailing requirements. Refer to structural diagrammatic plans and detailed schematic sketches in Appendix C.
- One significant recommendation made by our firm would be to look into relocating the existing fire rescue from the lower floor to new facilities elsewhere. The potential benefits are numerous and expanded upon in the body of this report for discussion.

Costing Summary:

The following Order of magnitude Cost Estimates are provided below for the two possible building renovation options. The cost estimates provided are at the level of Class 4 ASTM E2516-11. The expected accuracy range is +30% to -20% for a project that is defined up to 15% complete.

Renovation Option	Low Cost Estimate	Median Cost Estimate	High Cost Estimate
Option #1 Post Disaster Occupancy	$1,000,000	$1,300,000	$1,700,000
Option #2 Normal Occupancy	$650,000	$800,000	$1,000,000

For comparison, based upon an approximately 12,000 square foot building, the replacement cost for the existing facility is estimated to be: $3,500,000.

Summary:

The existing building appears to be in good repair, however in order to meet the structural requirements of the 2012 BC Building Code and the local design climatic data, the existing building would require some significant retro-fitting. Please refer to main report for further detail. The existing SLRD Office Building would potentially become non-operational, in its current state, if subjected to the 2012 BC Building Code lateral loading. Renovation and expansion of the existing building are feasible, but practical, if limited to renovating the existing building for office occupancy and not post-disaster emergency service occupancy.

STRUCTURAL REVIEW OF SQUAMISH-LILLOOET REGIONAL DISTRICT OFFICE BUILDING, 1350 ASTER ST., PEMBERTON, BC

May 28, 2015

Prepared for:

Squamish-Lillooet Regional District & Village of Pemberton

Prepared by:
Fromme Engineering Ltd.
P.O. Box 2600, Squamish, BC
V8B 0B7
Tel: (604) 815-0858

Table of Contents

Table of Appendixes

1.0 Introduction:

At the request of the Squamish Lillooet Regional District (SLRD), Fromme Engineering Ltd. has prepared the following Structural Review of the SLRD office building located at 1350 Aster St. Pemberton, BC. The purpose of the report is to give an evaluation of any structural issues present in the existing building. In particular, our evaluation has focused upon the following specific concerns brought forward by SLRD management:

- The structural integrity of the existing structure and foundations –both interior and exterior of the entire building.
- Any upgrades needed to bring the building up to the current building codes.
- Requirements to upgrade the building to expand the top floor (possibly off the south east corner)
- Structural requirements to enclose the area under the annex at the back of the building and convert to office space.
- Whether the storage cage at the rear of the building can be converted into an addition to accommodate the extra space needed for a new ladder truck.
- The potential of lowering one of the bays a couple of feet to accommodate the height issues experienced by the fire trucks.
- The possibility of raising the bay doors, and addressing related issues with front foundations.

In addition, further to the above noted items, SLRD management has also requested order of magnitude cost estimates, for the following building upgrading options:

Option #1 – Retain the Fire Rescue occupancy at the ground floor and renovate the existing building to meet the Post Disaster Importance Category.

Option #2 – Relocate the Fire Rescue occupancy at the ground floor and renovate the existing building to meet the Normal Importance Category.

Our evaluation provides a series of possible retrofitting recommendations which address the majority of deficiencies we have identified and the specific concerns of SLRD management. Note that the majority of this report is focused upon building upgrade Option #1 as noted above, with any significant differences between Options noted. A representative of Fromme Engineering Ltd. visited the site on several occasions; extensive use was also made of the structural and architectural drawings for the annex addition. This information combined with a knowledge of construction practices of this period, are the main reference material for this report.

2.0 Building Description:

The existing building is two-story, mixed construction (concrete block masonry and wood frame) currently being occupied as the Village of Pemberton Fire Rescue/Main Fire Hall at the ground floor and SLRD offices on the second floor. The existing building was constructed in 1968 and was originally known as The Municipal Building. The building was expanded in 1983 and the SLRD moved into the upper floor at that time. The building was expanded again in 1994 and most recently a new truck bay was added at the east end. As a result of the ongoing renovations and expansions, some discontinuity currently exists in the configuration of the structural systems. In addition, with the occupancy of the ground floor as a Fire Hall, the building has been evaluated as an emergency response facility with post disaster importance classification. Given the past utilization of the existing building during the 2003 flood event, the above classification is considered appropriate.

For practical reasons the lateral load resistance capacity of the existing building has been primarily focused upon the 2012 BC Building Code specified seismic design provisions. Although not in a high seismic zone, Pemberton has moderate seismic loading which combined with significant snow loading and above noted classification of the building as post disaster, produce reasonable lateral design forces that have been utilized in the evaluation. The building could potentially be subjected to flood/debris flow loading, but this scenario has not been specifically evaluated. A flood hazard report, specific to the building, has not been made available or commissioned to our knowledge. The building is situated just below where Pemberton creek enters the village and makes a sharp turn to follow the southern edge of its fan (NHC 2001). It is also our understanding that the flood vulnerability of the upstream reach on the Pemberton creek fan has not been established (KWL 2002).

A more detailed description of the building assemblies is given in Appendix B. Also included in Appendix C, are diagrammatic floor plans of the existing structure showing possible remedial structural retro-fitting options. Appendix D contains details of cost estimates for the previously mentioned building upgrading Options.

3.0 Building Evaluation:

After obtaining and reviewing the relevant documentation, performing the required calculations, and conducting several site inspections. The following statements can be made:

Second Floor (Supporting Roof Over): Refer to SK-3 in Appendix C:

- With current code loading the existing lintels at north and south bearing walls are under capacity.
- With current code loading, the existing Parallam beams, supporting roof at the annex extension, are under capacity.
- Connection of roof structure down to exterior walls for the majority of upper floor perimeter is insufficient.
- No definitive shear walls or hold downs for resolving lateral design forces.
- Possible under-strength roof deck sheathing
- One portion of roof supported by pony walls over existing ceiling joist. (indeterminate load path continuity)

Ground Floor (Supporting 2nd Floor Over): Refer to SK-2 in Appendix C:

- Typical floor joist in office are marginal for typical office loading.
- Uncertainty exists regarding the support of upper floor; assumed bearing walls picking up ceiling joist and pony wall combo rafter support (See Structural Sketches in Appendix C).
- As a result of how the roof loads are distributed (see above, noted previously) the rough-sawn timber post and beam line, located midway between grid lines 2 & 3, are potentially under capacity as built (See Structural Sketches in Appendix C).
- Existing glulam beam running E – W at annex extension is marginal.
- The existing block walls are not code compliant for lateral load resistance in an emergency response facility.
- Insufficient connection of floor joist to lateral load resisting elements typical.
- Lack of strength and stiffness along north elevation existing block shear walls.
- Block walls showing settlement damage/cracking. Also non definitive connection of block walls for out of plane lateral forces.
- Indeterminate load path at grid line 3 if used for lateral load element locations.

Foundations: Refer to SK-1 in Appendix C:

- Signs of settlement in foundations in several locations, specifically at grid line C in location of previous flood event/water line break, and 2 & 3. The north side of the building appears to have settled.
- The majority of existing foundation structure is indeterminate, as no existing drawings appear to exist, except for the annex addition on the south side. Foundations shown in

diagrammatic sketches are assumed and would necessitate investigation/confirmation as required for any possible future renovations/expansions.

4.0 Recommendations:

Note the following recommendations have been given for building upgrading Option #1 as noted previously. Significant differences pertaining to Option #2 are indicated with an asterisk '*'. The following is a list of structural recommendations made by our firm:

Second Floor (Supporting Roof Over): Refer to SK-3 in Appendix C:

- At next re-roofing replace existing damaged portions of roof sheathing to suit, plus add additional 5/8 inch tongue and grove plywood over-lay on existing.
- Upgrade connection of existing roof trusses to exterior walls and along potential additional shear wall locations at 2nd floor (See Sketches in Appendix C).
- Add shear walls and hold-down anchors in strategic locations at upper floor (See Sketches in Appendix B).
- Strengthen existing connections and reinforce existing beams at grid line B (See Sketches in Appendix C).
- Reinforce existing lintels at north and south elevations along grid lines A & C.

Ground Floor (Supporting 2nd Floor Over): Refer to SK-2 in Appendix C:

- Add new steel moment frame and required collector elements for lateral load resistance at north side.
- * Note : for Option #2 – north elevation reconstruction would entail infilling portions of the existing O/H door openings and not steel moment frames.
- Verify and reinforce as necessary floor diaphragm connections at perimeter of existing block walls (See Sketches in Appendix C).
- Upgrade and reinforce existing rough-sawn post & beam line, located midway between grid lines 2 & 3.
- Reinforce floor joist in two bays east & west of existing rough-sawn post & beam bearing line along grid line 3.
- Add additional shear walls and hold downs at interior wall locations (See Plan in Appendix C). * Not required for Option #2.
- Possible reinforcing required at annex addition portion. New posts and beams, reinforce existing posts as required to facilitate new beam connections (See Plan in Appendix C).
- Indeterminate load path for shear walls at grid line 3 may require reinforcing of floor and connection to existing block wall at grid line 3.

Foundations: Refer to SK-1 in Appendix C:

- Add pad footings under proposed moment frame columns at north side.
- Upgrade as required foundation at Annex portion as determined by extent and scope of possible addition/renovation.

- The possible expansion off the south east corner of the building could be somewhat beneficial as additional lateral load resisting elements could be introduced. However, the north elevation would still require strengthening.
- The possible enclosing of space under the annex and modification of storage cage area is feasible from a structural stand point.
- The lowering of one of the bays by a couple of feet is feasible but would require extensive foundation work and removal and replacement of existing affected block walls.
- The possible raising of bay doors and addressing the settlement noted at the north side can be incorporated into a new proposed moment frame at the north side.

5.0 Discussion:

Strong, sustained growth is predicted for the SLRD in the next thirty years. The rate of growth in the region has been consistently higher than the provincial average. The population of the SLRD more than doubled from 16,232 residents to 35,225 in the thirty year period from 1976 to 2006 (SLRD-Regional Growth Strategy 2014).

Certain building uses such as hospitals, police and fire stations and other emergency services can be considered more vulnerable than other buildings because of their importance to disaster relief and recovery. While it is important to maintain the continuity of government when dealing with natural disasters, providing adequate fire protection services and protecting theses services is essential.

The existing SLRD Office Building would potentially become inoperative in its current state if subjected to the 2012 BC Building Code seismic loading. The existing building is approximately forty seven years old and has seen a number of renovations and expansions. The lateral load resisting system performance has most likely never been expressly addressed. The majority of structural deficiencies, not related to lateral load path discontinuity or settlement, result from the classification of the building as an emergency response facility. This results in larger gravity loads and enhanced lateral design criteria.

Our firm is strongly recommending that the Village of Pemberton relocate the primary Fire Rescue Services to a new facility. Some of the benefits would be:

- Less vulnerability with respect to delivery disruption.
- Facilitate better fire personnel training.

- Safer for fire services personnel.
- New facilities could accommodate existing/new equipment and vehicles.
- Enhance fire services personnel moral and retention.

By relocating the fire rescue services, and delegating a new facility to post disaster use, the existing SLRD tenancy could be expanded into the vacated ground floor. Structural upgrades would still be necessary but not to the extent as would be required for the existing building to function as a post disaster facility. For example, the existing overhead doors could be partially infilled along the north elevation, instead of reinforcing the elevation with steel moment frames. In addition, some of the marginal or under capacity gravity load resisting elements, identified in this investigation, would be acceptable when evaluated without the post disaster importance classification.

6.0 Building Upgrading Cost Estimates:

Fromme Engineering Ltd. Has based our cost estimates by comparison to similar completed projects. In addition, costing information was obtained from relevant contracting and material supply companies in the proposed project vicinity. The cost estimate was prepared according to ASTM E2516-11 for a Class 4 estimate. The expected accuracy range for a Class 4 cost estimate varies between +30% to -20% for a project that is defined up to 15% complete. To provide a more detailed and accurate cost estimate, further site investigation, evaluation and detailed design will need to be carried out, and drawings and specifications will need to be prepared. The cost estimate includes allowances for several components that cannot be clearly defined at this stage of our assessment:

Component	**Allowance**
Miscellaneous architectural restoration	10%
Mechanical removal/reinstallation	5%
Electrical removal/reinstallation	3%
Hazardous materials assessment, removal and abatement	$5 / sf
General contractor overhead, profit, insurance, mobilization, etc.	20%
Construction Contingency	20%
Consultants fees	15%

In addition the cost estimates includes design and construction of the structural upgrading, and does not include soft costs such as taxes, moving costs, temporary facilities, loss of use/revenue, building permit fees, client administration time, etc.

7.0 Summary:

The existing SLRD Office Building is at risk from lateral loading, either from earthquakes or flood/debris flows. Ideally the structure should be robust and have ductile elements that can dissipate energy. The ductile elements need to act as a fuse, protecting more brittle and less detailed elements. And the lateral force resisting system must be connected together such that lateral forces from any part of the building have a path to lateral resisting elements (specifically shear walls, braced frames or moment frames) that can carry the forces out of the building. The existing building requires structural retro-fitting to adequately resist lateral loading; the extent of which is dependent, in part, upon the building classification. Also, if the building is analyzed with the enhanced loading for post disaster classification, some of the existing gravity carrying systems would be marginal or under capacity.

The proposed renovations to the existing building such as expansion off the south east corner, enclosing space under the annex and modification of the storage cage are all readily accomplished structurally. However, the options of lowering one bay door by a couple of feet or raising bay doors while addressing settlement on the north side, would require more extensive structural work. The practical solution to the above noted requirements and challenges is to relocate the Village of Pemberton Fire Rescue to new facilities, while renovating the existing SLRD Building for office use and occupancy only, and not emergency services.

Prepared by:
Fromme Engineering Ltd.

Mike Fromme, P. Eng
Principle

8.0 References

1.0 British Columbia Building Code 2012, Crown Publications 2012.

2.0 Canadian Wood Design Manual, Canadian Wood Council.

3.0 CAN/CSA – 086 Engineering Design in Wood, Canadian Standards Association.

4.0 User's Guide – NBC 2010 Structural Commentaries (Part 4 of Division B)., National Research Council of Canada, 2010.

5.0 CAN/CSA-S16.1 Limit States Design of Steel Structures, Canadian Standards Association of Canada.

6.0 CSA Standard A 23.3 Design of Concrete Structures, Canadian Standards Association.

7.0 Engineering Guide for Wood Frame Construction, 2009 Edition, Canadian Wood Council.

8.0 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses Truss Plate Institute of Canada

9.0 Structural Steel for Canadian Buildings. A Designers Guide, Andrew W.F. Metten

10.0 Masonry Structures Behavior and Design, Canadian Masonry Design Centre.

11.0 CSA Standard S304.1-Design of Masonry Structures, Canadian Standards Association.

12.0 SLRD Fire Services Review, Dec 2013.

13.0 Pemberton Creek Fan Flood/Geohazard and Dike Study, Dec 20, 2001, Northwest Hydraulic Consultants.

14.0 Engineering Study for Lillooet River Corridor, Dec 2002, Kerr Wood Leidal Associates Ltd.

15.0 2003 Pemberton Flood Presentation, Village of Pemberton.

16.0 Squamish-Lillooet Regional District, Regional Growth Strategy, 2014.

17.0 Village of Pemberton Official Community Plan.

APPENDIX A
Site Visit Photographs

Photo A1 – Pony Walls Supporting Roof Sheathing

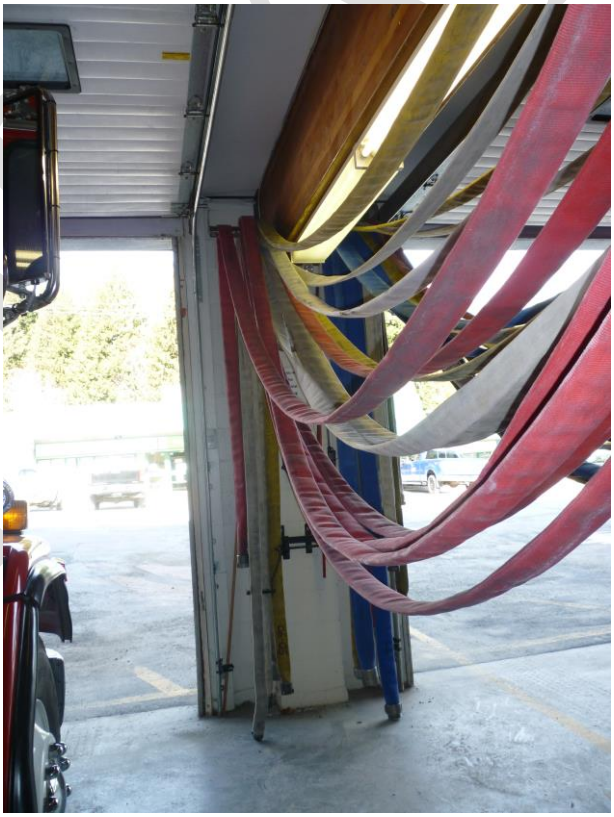


Photo A2 – Hose Drying Ground Floor

Photo A3 – Settlement Crack in Block Wall

Photo A4 – Diagonal Crack in Block Wall Pier

APPENDIX B
Building Assembly Descriptions

Building Assembly Description:

Between Grid Lines B3 & D5: Refer to SK-1 thru SK-3 in Appendix C:

Roof (flat)

- Built-up roof.
- T&G Plywood (assume 1/2 inch, condition and thickness not determined).
- Parallel Chord TJI Wood Trusses with metal tube web members.
- Batt. insulation.
- GWB ceiling.

Floor (between 2nd. and ground)

- Floor finish varies.
- Plywood (assume 5/8 inch T&G).
- 2X12@16" O.C. Joist.
- Batt. Insulation.
- GWB Ceiling.

Walls (exterior-2nd. floor)

- Wall finish varies.
- Plywood (assume 3/8 inch).
- 2X6 or 2x4@16" O.C. Studs.
- Batt. Insulation.
- GWB Finish.

Walls (interior-2nd. floor)

- GWB finish both sides.
- 2x4@16" O.C. Studs.

Walls (exterior-ground floor)

- 8 inch concrete block painted (assume nominal grout and reinforcing).

Walls (interior-ground floor)

- 8 inch concrete block painted (assume nominal grout and reinforcing) or GWB both sides 2X4 or 2X6 @16" O.C. stud wall.

Foundations (exterior and interior)

- Assume to be conventional strip and pad footings (nominally reinforced).

Building Assembly Description Cont.:

Between Grid Lines B2 & D3: Refer to SK-1 thru SK-3 in Appendix C:

Roof (flat)

- Built-up roof.
- T&G Plywood (assume 1/2 inch, condition and thickness not determined).
- Continuous 2X4@16" O.C. pony walls on sleepers, supporting plywood sheathing directly.
- Existing old built-up roof (tar and gravel).
- 2X12@16" O.C. roof rafters.
- Batt. insulation.
- GWB ceiling.

Floor (between 2nd. and ground)

- Floor finish varies.
- Plywood (assume 5/8 inch T&G).
- 2X12@16" O.C. Joist.
- Batt. Insulation.
- GWB Ceiling.

Walls (exterior-2nd. floor)

- Wall finish varies.
- Plywood (assume 3/8 inch).
- 2X6 or 2x4@16" O.C. Studs.
- Batt. Insulation.
- GWB Finish.

Walls (interior-2nd. floor)

- GWB finish both sides.
- 2x4@16" O.C. Studs.

Walls (exterior-ground floor)

- 8 inch concrete block painted (assume nominal grout and reinforcing).

Walls (interior-ground floor)

- GWB both sides 2X4 or 2X6 @16" O.C. stud wall.

Foundations (exterior and interior)

- Assume to be conventional strip and pad footings (nominally reinforced).

Building Assembly Description Cont.:

Between Grid Lines B1 & D2: Refer to SK-1 thru SK-3 in Appendix C:

Roof (flat)

- Built-up roof.
- T&G Plywood (assume 5/8 inch).
- Conventional wood trusses.
- Batt. insulation.
- GWB ceiling.

Floor (between 2nd. and ground)

- Plywood (assume 5/8 inch T&G).
- 2X10@16" O.C. Joist.
- GWB Ceiling.

Walls (exterior-2nd & ground floor)

- Wall finish varies.
- Plywood (assume 5/8 inch).
- 2X6@16" O.C. Studs.
- Batt. Insulation.
- GWB Finish.

Walls (interior-2nd & ground floor)

- GWB finish both sides.
- 2x4@16" O.C. Studs.

Foundations (exterior and interior)

- Assume to be conventional strip and pad footings, reinforced as per current code requirements.

Between Grid Lines A2 & B4: Refer to SK-1 thru SK-3 in Appendix C:

Roof (flat)

- Built-up roof.
- T&G Plywood (assume 5/8).
- Parallel Chord TJI Wood Trusses with metal tube web members.
- Batt. insulation.
- GWB ceiling.

Floor (between 2nd. and ground)

- Floor finish varies.
- Plywood (assume 5/8 inch T&G).

Building Assembly Description Cont.:

- 14 inch DP. TJI joist.
- R28 Batt. Insulation.
- 2-layers of type'X' GWB & furring channels.

Walls (exterior-2nd. floor)

- Wall finish varies.
- Plywood (assume 1/2 inch).
- 2X6@16" O.C. Studs.
- Batt. Insulation.
- 5/8 inch GWB Finish.

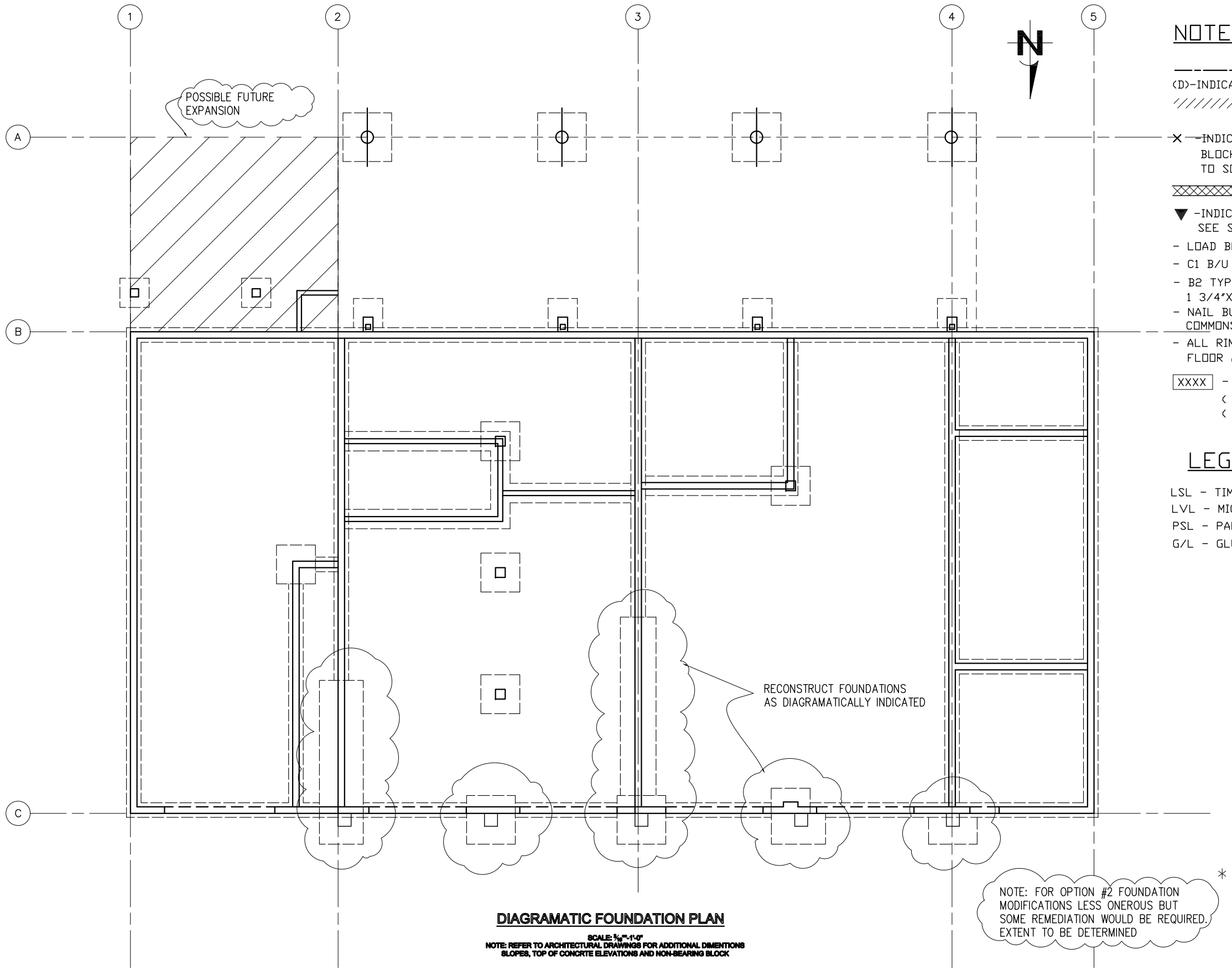
Walls (interior-2nd. floor)

- GWB finish both sides.
- 2x4 or 2X6@16" O.C. Studs.

Foundations (exterior and interior)

- Assume to be conventional strip and pad footings, reinforced as per current code requirements.

APPENDIX C
Diagrammatic Structural Plans



DIAGRAMATIC FOUNDATION PLAN

SCALE: 3/16"=1'-0"

NOTE: REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL DIMENTIONS SLOPES, TOP OF CONCRTE ELEVATIONS AND NON-BEARING BLOCK

NOTES:

———————— -INDICATES BEAM

(D)-INDICATES DROP BEAM

//////// -INDICATES LOAD BEARING WALL OVER PROVIDE SOLID BLOCKING BETWEEN JOIST

× -INDICATES POINT LOAD OVER PROVIDE SOLID BLOCKING DOWN TO BEAM OR POST DOWN TO SOLID BEARING.

XXXXXXXX -INDICATES SHEAR WALL

▼ -INDICATES SIMPSON HOLD DOWN ANCHOR SEE SCHEDULE

- LOAD BEARING WALLS SHOWN SHADED TYP.
- C1 B/U COLUMN TYP. U.N.O. 3-2X4 OR 2X6
- B2 TYPE BEAM TYP. U.N.O. 2-2X10 OR 1 3/4"X JOIST DEPTH TIMBER STRAND.
- NAIL BUILT UP BEAMS WITH 2 ROWS OF 3" COMMONS AT 8" O.C.
- ALL RIM BOARDS AND TRIMMERS IN ENG. FLOOR AREAS 1-3/4"XTO SUIT TIMBER STRAND

[XXXX] - INDICATES FACTORED BEAM REACTION IN POUNDS
(-VE INDICATES DOWNWARD REACTION)
(+VE INDICATES UPWARD REACTION)

LEGEND:

LSL - TIMBER STRAND BEAMS 1.5E GRADE
LVL - MICROLAM BEAMS 1.8E GRADE
PSL - PARALLAM BEAM 2.0E GRADE
G/L - GLULAM BEAM 24fE GRADE

NO.	DATE	REVISION/ISSUE
1	MAY 28/2015	ISSUED FOR REPORT
0	APRIL 15/2015	ISSUED FOR REVIEW

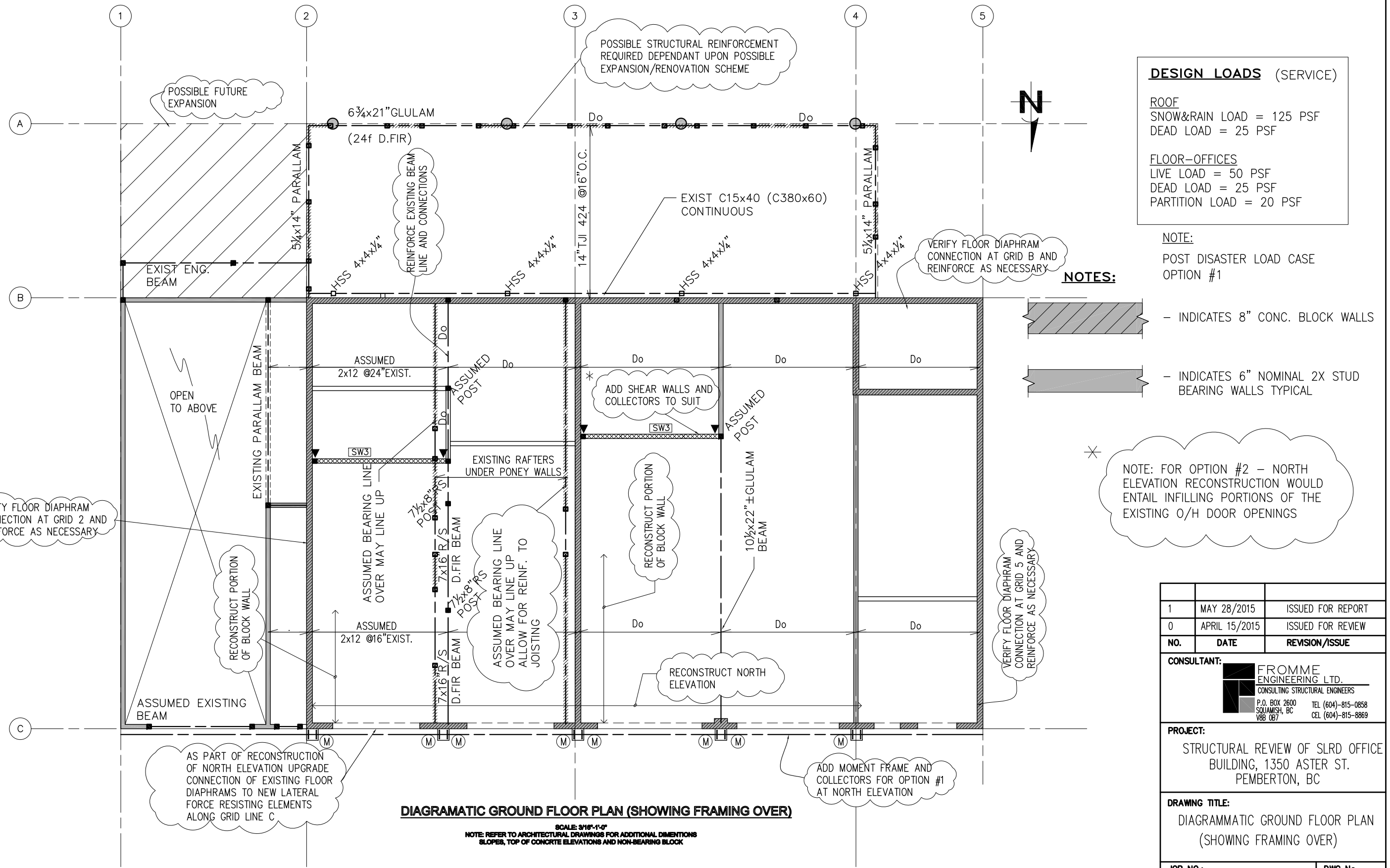
CONSULTANT:
FROMME ENGINEERING LTD.
CONSULTING STRUCTURAL ENGINEERS
P.O. BOX 2600
SQUAMISH, BC
V8B 0B7
TEL (604)-815-0858
CEL (604)-815-8869

PROJECT:
STRUCTURAL REVIEW OF SLRD OFFICE BUILDING, 1350 ASTER ST. PEMBERTON, BC

DRAWING TITLE:
DIAGRAMMATIC FOUNDATION PLAN

JOB NO.:	15003003
DATE:	MAY 2015
SCALE:	N.T.S.

DWG No. SK1



DIAGRAMATIC GROUND FLOOR PLAN (SHOWING FRAMING OVER)

SCALE: 3/16"-1'-0"
NOTE: REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL DIMENTIONS SLOPES, TOP OF CONCRTE ELEVATIONS AND NON-BEARING BLOCK

DESIGN LOADS (SERVICE)

ROOF
SNOW&RAIN LOAD = 125 PSF
DEAD LOAD = 25 PSF

FLOOR–OFFICES
LIVE LOAD = 50 PSF
DEAD LOAD = 25 PSF
PARTITION LOAD = 20 PSF

NOTE:

POST DISASTER LOAD CASE OPTION #1

NOTES:

– INDICATES 8" CONC. BLOCK WALLS

– INDICATES 6" NOMINAL 2X STUD BEARING WALLS TYPICAL

NOTE: FOR OPTION #2 – NORTH ELEVATION RECONSTRUCTION WOULD ENTAIL INFILLING PORTIONS OF THE EXISTING O/H DOOR OPENINGS

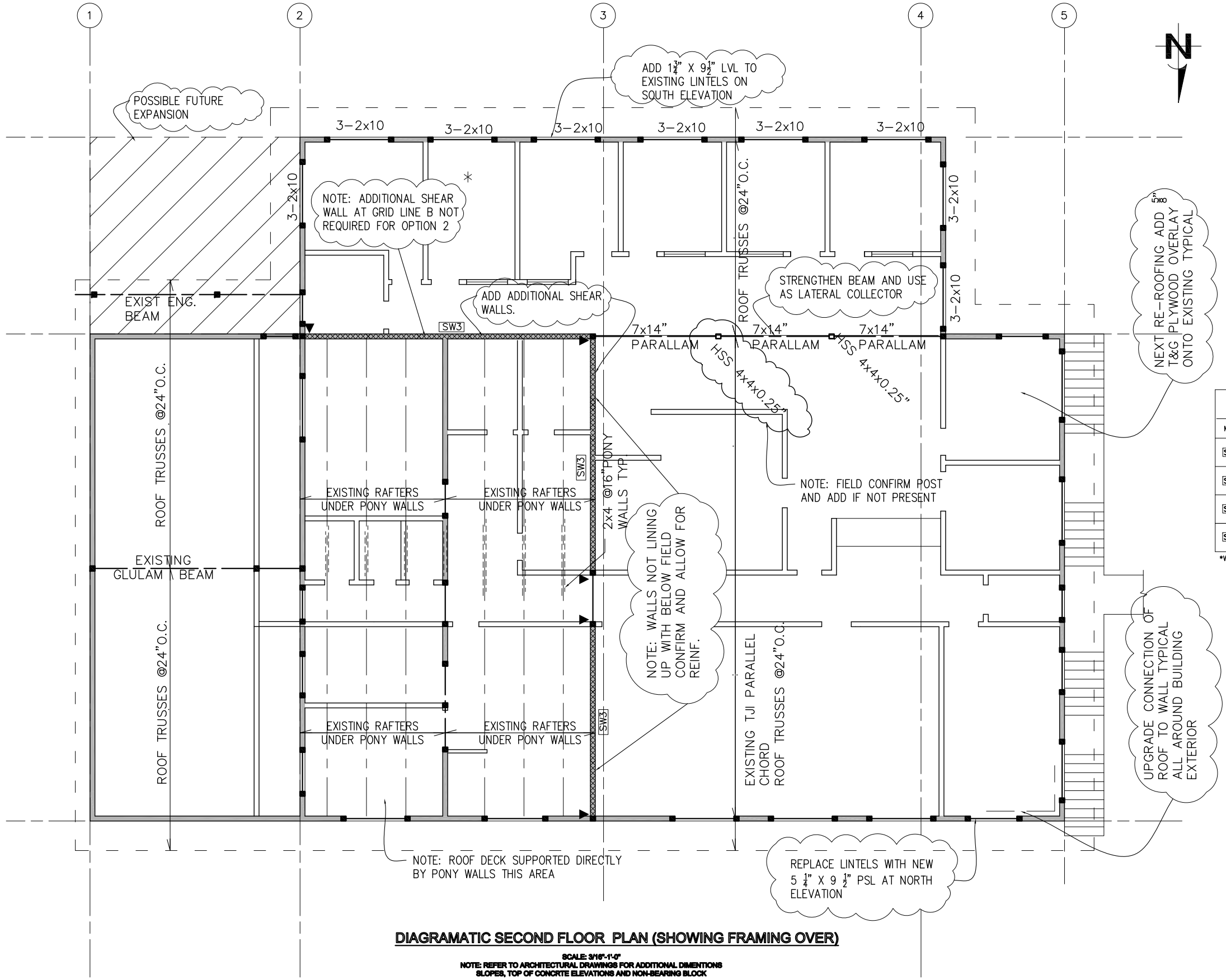
NO.	DATE	REVISION/ISSUE
1	MAY 28/2015	ISSUED FOR REPORT
0	APRIL 15/2015	ISSUED FOR REVIEW

CONSULTANT:
FROMME ENGINEERING LTD.
CONSULTING STRUCTURAL ENGINEERS
P.O. BOX 2600 SQUAMISH, BC V8B 0B7
TEL (604)–815–0858
CEL (604)–815–8869

PROJECT:
STRUCTURAL REVIEW OF SLRD OFFICE BUILDING, 1350 ASTER ST. PEMBERTON, BC

DRAWING TITLE:
DIAGRAMMATIC GROUND FLOOR PLAN (SHOWING FRAMING OVER)

JOB NO.:	15003003
DATE:	MAY 2015
SCALE:	N.T.S.
DWG No.	SK2



DIAGRAMATIC SECOND FLOOR PLAN (SHOWING FRAMING OVER)

SCALE: 3/16"-1'-0"
NOTE: REFER TO ARCHITECTURAL DRAWINGS FOR ADDITIONAL DIMENTIONS SLOPES, TOP OF CONCRTE ELEVATIONS AND NON-BEARING BLOCK

DESIGN LOADS (SERVICE)

ROOF
SNOW+RAIN LOAD = 125 PSF
DEAD LOAD = 25 PSF

NOTE:
POST DISASTER LOAD CASE OPTION #1

'*' – DENOTES OMISION FOR OPTION #2 SEE REPORT

– DENOTES NEW WORK

SHEARWALL SCHEDULE

MARK	SHEATHING	EDGE NAILING	BODY NAILING
SW1	1/2" PLYWOOD ONE SIDE	3" COMMON NAILS @4" O.C.	3" COMMON NAILS @6" O.C.
SW2	1/2" PLYWOOD ONE SIDE	3" COMMON NAILS @2-1/2" O.C.	3" COMMON NAILS @6" O.C.
SW3	1/2" PLYWOOD ONE SIDE	3" COMMON NAILS @2-1/2" O.C.	3" COMMON NAILS @4" O.C.
SW4 *	1/2" PLYWOOD BOTH SIDES	3" COMMON NAILS @4" O.C.	3" COMMON NAILS @4" O.C.

*WALL SHEATHED TWO SIDES

NO.	DATE	REVISION/ISSUE
1	MAY 28/2015	ISSUED FOR REPORT
0	APRIL 15/2015	ISSUED FOR REVIEW

CONSULTANT:
FROMME ENGINEERING LTD.
CONSULTING STRUCTURAL ENGINEERS
P.O. BOX 2600
SQUAMISH, BC
V8B 0B7
TEL (604)-815-0858
CEL (604)-815-8869

PROJECT:
STRUCTURAL REVIEW OF SLRD OFFICE BUILDING, 1350 ASTER ST. PEMBERTON, BC

DRAWING TITLE:
DIAGRAMMATIC SECOND FLOOR PLAN (SHOWING FRAMING OVER)

JOB NO.:	15003003
DATE:	MAY 2015
SCALE:	N.T.S.
DWG No.	SK3

APPENDIX D
Building Upgrading Cost Estimates

Option #1 – Post Disaster Occupancy Building Upgrading Class 4 Cost Estimate	
Item	**Total**
Total Area	12000 sf
Roof	$95,000
Upper Floor	$50,000
Main Floor	$50,000
Walls	$220,000
Foundations	$175,000
Miscellaneous and Non-Structural	$55,000
Subtotal 1	$645,000
Additional Arch (10%), Mech (5%), Elec (3%)	$120,000
Hazardous Material Allowance ($5/sf)	$60,000
Subtotal 2	$825,000
Contractor Overhead and Profit (20%)	$165,000
Construction Contingency (20%)	$165,000
Consultant Fees (15%)[5]	$150,000
Total	**$1,300,000 $110/sf**

Note:

1. Costs are based on carrying out project all at once with no phasing.
2. The cost estimate is an ASTM Class 4 Cost Estimate with an expected accuracy of between +30% and -20% for a project that is defined up to 15% complete.
3. No drawings are developed as part of this cost estimate.
4. The cost estimate does not include soft costs, such as taxes, moving costs, temporary facilities, loss of use/revenue etc.
5. Consultants fees are calculated as a percentage of the subtotal of all elements except the construction contingency

Option #2 – Normal Occupancy Building Upgrading Class 4 Cost Estimate		
Item	**Total**	
Total Area	12000 sf	
Roof	$60,000	
Upper Floor	$30,000	
Main Floor	$30,000	
Walls	$130,000	
Foundations	$110,000	
Miscellaneous and Non-Structural	$30,000	
Subtotal 1	$390,000	
Additional Arch (10%), Mech (5%), Elec (3%)	$70,000	
Hazardous Material Allowance ($5/sf)	$60,000	
Subtotal 2	$520,000	
Contractor Overhead and Profit (20%)	$105,000	
Construction Contingency (20%)	$105,000	
Consultant Fees (15%)[5]	$100,000	
Total	**$830,000**	**$70/sf**

Note:
1. Costs are based on carrying out project all at once with no phasing.
2. The cost estimate is an ASTM Class 4 Cost Estimate with an expected accuracy of between +30% and -20% for a project that is defined up to 15% complete.
3. No drawings are developed as part of this cost estimate.
4. The cost estimate does not include soft costs, such as taxes, moving costs, temporary facilities, loss of use/revenue etc.
5. Consultants fees are calculated as a percentage of the subtotal of all elements except the construction contingency