The following General Guide Notes for Timber Frame Engineering Drawings have been developed over time by David Hourdequin, PE and were reviewed before posting this edition by Janet Kane, PE and Shawn Ausel, PE in October, 2020. These notes are used on drawings typically prepared by a timber frame system designer and reviewed by specialty timber frame engineer on behalf of either an owner or timber frame contractor for the production and installation of the timber frame and related work.

Our purpose in sharing them with you is to serve as a check list for items we believe are important for the success of each project and to convey a clear understanding regarding responsibilities of others involved in the design and construction process. As the specialty timber frame engineer, you must decide what is and is not important and edit the Guide Notes specifically for each project.

Note: The TFEC bears no liability for the contents.

If you would like an MS Word file of the document, send your request to David Hourdequin, PE at drh@dremy.com

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GENERAL NOTES

The information on these drawings applies solely to this project.

Do not scale the drawings. If a required dimension is not indicated, please request the missing information.

The engineering design is based on drawings provided by others. **It is the responsibility of the purchaser (owner and/or contractor) to verify all dimensions indicated on the timber frame system drawings.**

These drawings are for the heavy timber superstructure only as herein defined below for the structure or structures indicated. Architectural details such as waterproofing, flashing, roofing, finishes, coatings; the design of the chimney and fireplace; the design of hvac, plumbing, and electrical systems and the site work are the responsibility of others.

Timbers will shrink after installation until they reach the EMC (Equilibrium Moisture Content). This will cause the loosening of bolts and threaded connectors. Periodic tightening of these connections by the end user during the first several years of the structure's service life may be required. See technical specifications hereinbelow.

Normal construction tolerances/dimensional variations can be expected in the completed structure as well as dimensional changes due to shrinkage and swelling throughout the life of the structure. For these reasons, details of adjoining surfaces and materials must be able to accommodate these variations and changes. Expect joinery to open somewhat due to

shrinkage from initial moisture content at the time of fabrication until EMC (Equilibrium Moisture Content) is reached.

Some warping, twisting, checking, and splitting of timbers as they reach equilibrium moisture content can be expected.

The key to the long-term survivability of the structure depends on keeping the timbers sealed, dry and well ventilated. These design details are the responsibility of others.

DESIGN ASSUMPTIONS and RELATED DETAILS

The load bearing timber system as described in these documents and being supplied by this manufacturer is designed to resist in-plane gravity and wind uplift loads only. It is the responsibility of the engineer of record to design all supporting elements, including but not limited to: roof structural decking/sheathing system (to transfer roof diaphragm shear); the shear wall system; load bearing walls and posts; and the foundation system to resist the lateral, uplift and gravity loads indicated.

The lateral force resisting system shall be designed and detailed by others. To resist lateral loads, this heavy timber framed roof system requires shear walls and diaphragms. The system design as well as all connections between the lateral force resisting system and the timber framing system and foundation is the responsibility of the EOR.

Temporary bracing for lateral stability is the responsibility of the contractor. Adequate temporary bracing must be installed and maintained to resist lateral loads and erection loads until all of the structural systems defined on the drawings herein have been completely installed.

Timber knee braces may provide some lateral stability during erection depending on wind direction. It is the responsibility of the erector/installer of the timber frame system to provide temporary lateral bracing and guying systems until the structural components of the exterior wall system have been completed and connected to the timber frame system and the foundation.

The exterior wall and roof framing and sheathing systems and connections between them and the timber frame system shall be designed and installed by others to transfer lateral loads due to wind or seismic forces through the roof and timber frame to the wall system and the foundation.

Continuous double 2x top plates are assumed and required for the anchorage of specified screws to resist uplift. It is the responsibility of others to design and install any connections required to transfer these loads to the foundation.

Any required spacers between the timber frame and the wall system to tuck dry wall sheathing behind the timber frame must be structural plywood or oriented strand board. Drywall/gypsum board spacers are not permitted for the transfer of lateral loading between the timber frame and stud framed or SIP wall systems.

OSB or structural plywood sheathing by others may be required as part of the lateral load resisting system in addition to tongue and groove roof decking. If required, the overlay sheathing shall be designed and installed by others and fastened directly to the 2x6 T&G and to the timber frame.

Shear walls must be balloon framed to extend to the underside of the overlaid 2x6 decking (which shall lap over the top of these walls) and fastened to transfer roof diaphragm shear to the walls. Shear walls must 'follow' gabled profiles.

TEMPORARY SUPPORT OF THE HEAVY TIMBER SYSTEM/S

Temporary support of the heavy timber system including, but not limited to, lateral bracing, bridging, blocking, strong-backs (or other devices as required), and connections from the timber frame system to the lateral force resisting system shall be installed and maintained while the remainder of construction is completed. Once all construction is complete, the temporary support system components may be removed and returned to the supplier of that material.

TIMBER FRAME SYSTEM ENGINEERING DRAWING NOTES (Choose appropriate paragraphs.)

This is a **Load Bearing Heavy Timber System**. No other systems or materials are included.

This is a **non-structural, self-supporting heavy timber framing system**. It will bear on wall framing and be laterally supported by other roof framing. It is the **Responsibility of Others** to insure the structural framing can support the additional load. The reactions at each support point are indicated on the plans. Install blocking every 36" throughout the length of each truss or bent to resist a lateral load of not less than 100 pounds perpendicular to the plane of the truss or bent. Blocking must be a minimum of 3" thick to receive structural screw embedment length. Blocking must be clearly seen or noted. If sheathing is in place, blocking must be clearly marked on the surface.

This is a **non-structural, non self-supporting heavy timber framing system**. It will be suspended from other roof framing. It is the **Responsibility of Others** to insure the structural framing can support the additional load. The reactions at each support point are indicated on the plansInstall blocking every 36" throughout the length of each truss or bent to resist a vertical load of not less than 200 pounds unless otherwise noted. Blocking must be a minimum of 3" thick to receive structural screw embedment length. Blocking must be clearly seen or noted. If sheathing is in place, blocking must be clearly marked on the surface.

Other included systems (if any) are:

T&G Roof Decking; OSB Diaphragm Sheathing; SIP Wall and/or Roof Panels; Glulam Elements; SIP Roof System; and, SIP Wall System

APPLICABLE STRUCTURAL CODES:

2018 International Residential/Building Code with local and state amendments;
ASCE 7-16;
AF&PA NDS 2018;
TFEC 1-2019 Standard of Design of Timber Frame Structures and Commentary

QUALITY CONTROL CRITERIA

TFEC 2-2018 Code of Standard Practice for Timber Frame Structures

DESIGN CRITERIA

WIND LOADS:
- Design Wind Speed: 115 MPH (Ultimate), 3-Second Gust
- Exposure Category: C
- Building Classification: II
- Wind Importance Factor: 1.0
- Enclosure Classification: Enclosed with protected openings.

SEISMIC LOADS: Not Applicable/Not Controlling

ROOF SNOW LOAD
- Ground Snow Load: 35 PSF (Controls Roof Design)
- Exposure Factor, Ce: 1.2 (assumed 'sheltered')
- Thermal Factor, Ct: 1.0
- Roof Slope Factor, Cs: 1.0
- Importance Factor, I: 1.0

ROOF LIVE LOAD: 20 PSF (Not Controlling)
ROOF DEAD LOAD: 20 PSF Along the Slope Plus Weight of Timber
FLOOR LIVE LOAD: 40 PSF
FLOOR DEAD LOAD: 20 PSF Plus Weight Of Timber

NOTE: Concentrated Loads and Construction Loads must not exceed design loads above.

TIMBER

INTERIOR: Douglas Fir, #1 and Better, WCLIB Grading Rules, "Green" at time of fabrication and expected to be less than 19% moisture content in service, free of heart center and finished S4S in accordance with NDS 2012 Table 1B.

Note: Douglas Fir is not a “naturally durable wood” as defined in Section 202, which may be required by Section 2304.11 of the International Building Code. Its use in exposed locations requires special care in providing protective flashing, sealing or oiling of timbers, and ongoing/active maintenance and observation to prevent premature deterioration from rot, decay and UV degradation. The design and detailing of such system and coatings and inspection/maintenance procedures is the responsibility of others.

EXTERIOR: White Oak, #2, NELMA, “Green” at time of fabrication and expected to be less than 19% moisture content in service, box-heart, S4S in accordance with NDS 2012 Table 1B.

Timbers to be cut to length and end joinery complete, and then,

a. Apply two (2) coats of non-toxic, clear, wax emulsion end sealer (Heritage Natural Finishes, “Liquid Wax End Sealer”, or approved equal, to each end of each piece of timber as soon as possible after cutting timbers to length to minimize shrinkage induced end checking.

Timbers to have remaining joinery completed, sanded, trial fitted, and then,

b. Apply two (2) coats of non-toxic, clear, penetrating oil surface treatment (Heritage Natural Finishes, “Exterior Finish”, or approved equal) prior to shipment.
    i. Note: Fabricator must submit alternate products for approval prior to assuming they are acceptable for bid purposes.

OR

Timbers to be cut, trial fitted, sanded and shipped F.O.B. jobsite for installation. Any special coatings are ‘by others’ or as otherwise required by the heavy timber purchase agreement. The use of end grain sealer is recommended for all timbers to help resist end checking. Surface sealers to resist moisture penetration are recommended for all timber exposed to weather.

Special Truss Fabrication Note: Parallel Chord Trusses with tension splices shall be cambered L/180 where L is the span in inches.

SCREWS and FASTENERS

1. RSS (Rugged Structural Screws) high tensile/bending yield strength by GRK FASTENERS, or equal provided by www.grkfasteners.com installed in strict accordance with their guidelines. Screws shall be washer-headed. Shaft diameters shall be 5/16" diameter up to 7 ¼” long and 3/8" diameter for ~~from~~ 8” ~~long~~ and longer ~~above~~. Screws shall penetrate a minimum of 4” into receiving timber. Where heads would be visible, screws shall be installed in counter-bored holes to clear the head and allow approximately 1/2” for plugging.
2. ASSY SCREWS electroplated with a zinc layer thickness of 5-8 micro meters provided by www.MTCsolutions.com installed in strict accordance with their guidelines. Where heads would be visible, screws shall be installed in counter-bored holes to clear the head and allow

approximately 1/2” for plugging. SK type screws shall provide a minimum of 4” penetration into the receiving timber.

3. RICON CONNECTORS: As noted and provided by www.MTCsolutions.com installed in strict accordance with their guidelines. Provide the ‘optional’ uplift restraint clips on all connectors, no exceptions.

4. SIMPSON CONNECTORS: As noted and provided by www.strongtie.com installed in strict accordance with their guidelines.

5. LAG SCREWS: Lag screws shall be ‘galvanized’ unless otherwise noted. Drill two lead holes:
   a. for the threads at 65% to 85% of the shank diameter in wood with a specific gravity (SG) greater than 0.60;
   b. 60% to 75% for an SG between 0.50 and 0.60; and
   c. 40% to 70% for an SG equal to or less than 0.50 to insure a ‘tight grip’ into the timber receiving the threads;
   d. the lead hole for the smooth shank is equal to the diameter of the shank.

6. TIMBERLINX™ by www.timberlinx.com of the type and size noted on the details.

7. PEGS: 1" Diameter, Structural, Straight Grained, Black Walnut, White Oak, Red Oak or Locust treated with paraffin, linseed oil or similar sealing substance.

8. TENONS: (minimum dimensions unless otherwise noted)
   a. STUB TENONS: 2” Thick By 3/4" Long
   b. FULL TENONS: 2” Thick By 4-1/2” Long (1 ½” tenons into 51/2” thick timber)
   c. PEG SPACING: End Distance: 2 ½”, Edge Distance: 2”; Spacing: 2 ½” to 3”

9. BOLTS and PINS: ASTM Grade A307 (Interior) or Grade 316 Stainless Steel (Exterior) unless otherwise noted. (Installer Note: At least two full threads shall extend past the face of any nuts.) Bolt holes in timber shall be drilled to yield a tight fit requiring ‘moderate’ driving force with a mallet to seat the bolts. To compensate for the effects of cross grain shrinkage on bolted connections in ‘green’ timber, re-tighten all bolts:
   a) immediately prior to occupancy;
   b) six months after occupancy; and, c) 18 months after occupancy.

   OR

   Where the equilibrium moisture content is equal to or less than 19%, re-tighten bolts:
   c) immediately prior to occupancy;
   d) 12 months after occupancy.

10. DOWELS AND THREADED ROD TENSION TIE BOLTS: ASTM Grade A36 (Installer Note: At least two full threads shall extend past the face of any nuts or threaded turn-buckle sleeves.) Hi-Strength rods where noted shall be ASTM Grade A572 Gr 50.

11. CONCRETE ANCHOR SYSTEM: Cold Weather: Simpson AT-XP Acrylic Adhesive (14 degree limit); Warm Weather: Simpson SET-XP (45 degree limit) or SET-3G (40 degree limit). All installed in strict accordance with Simpson instructions. Installer Note: Temperatures are base material temperatures NOT air temperature.

12. STEEL ANGLES, PLATES AND FABRICATED CONNECTIONS: ASTM Grade A36

13. POST BASES/BRACKETS: As detailed.

14. FINISHES: All steel connections and hardware exposed to weather to be hot-dip galvanized, electrostatically coated or stainless steel unless otherwise noted.

"SUPPLEMENTAL SYSTEM NOTES" – (add as required)

CONCRETE MONOLITHIC FOOTINGS AND SLAB

1. Remove all organic material within five feet (5') away from the perimeter of the foundation and slab area.
2. Grade site level and with appropriate drainage (1/2" /foot away from the perimeter of the slab for at least ten feet(10').
3. Insure the exposed subsurface soils are compacted to at least 98% of the 'standard proctor density' and will support a minimum soil bearing load of 2,000 pounds per square foot. Engage a qualified soils testing lab for this purpose.
4. Insure that footings are inspected by the appropriate building inspection department.
5. Wood form all exposed edges 'straight and true'.
6. Reinforcing: ASTM Grade 60
7. Concrete: 4,000 PSI in 28 days
8. Slabs exposed to weather should be sloped to drain 1/8" per foot over anticipated exposure area.
9. Steel trowel finish slab as soon as slab will support troweling equipment.
10. Saw cut control joints 1 ½" deep as soon as slab will support equipment and joints can be cut without raveling.

SIP SYSTEM REQUIREMENTS

1. Material:
    a. Roof Panels: 10 ¼" thick (nominal) with 7/16 OSB skins and EPS foam core, installed where noted.
    b. Wall Panels: 6 ½" thick (nominal) with 7/16" OSB skins and EPS foam core, installed where noted.
2. Design and Installation Standards: Structural insulated panels (SIPs) shall be provided by a firm with demonstrated experience in the fabrication and installation of that system. Membership in SIPA (Structural Insulated Panel Association) will satisfy this requirement. The firm shall have a current code certification report (NTA or similar) with sizes, ~~and~~ span and load tables.

3. The SIP system shall be designed to resist required design loads as indicated or referenced above.
4. Where SIP systems are installed on framing by others, fastening requirements shall be designed to resist gravity loads, wind uplift, and diaphragm shear.
5. SIP system shop drawing shall be provided with a summary of the location, thicknesses and types of panels (type of foam core) with to-scale drawings of all supporting elements, layout of panels, sections, and details with fastening requirements noted.
6. The SIP system shop drawings and a copy of the current code certification report shall be submitted to the Timber Frame Specialty Engineer for review and approval prior to fabrication and installation of the SIP system.
7. The SIP system provided by this firm shall be manufactured in accordance with an Iso-compliant, third party manufacturing and design certification program, e.g., NTA or ICCES/PFS, which is in effect during the design & production of the panels.
8. Panel Screws: Panel screws shall be TRUFAST™ SIPTP or SIPLD Pancake Head with T-30 internal drive or equal with length sufficient to provide a minimum of 1 ½" penetration in receiving timber or panel, and spaced as indicated on the drawings. Unless otherwise noted, provide panel screws into all adjacent timbers at 12" on center.
9. Spline Connections: Secure splines with 0.131"dia. (8d) common nails or 1½" long 16 gage wide-crown (7/16") staples spaced as indicated on the drawings and oriented parallel to the edges of the panels. Unless otherwise indicated, space nails or staples at 6" on center along each side of the joint.
10. Any required spacers between the SIP panels and timber shall be OSB or structural plywood only. Do not use gypsum drywall for spacers. Secure wood spacers to timber with fasteners capable of transferring the full value of the shear along the joint line.
11. Where the top edges of the wall panels contain a spline (within the confines of the panel) and a cap plate (required for either vertical load or panel shear), the cap plate joints shall be staggered with the panel edges by 24" and secured to the inner spline with 0.131 x 3" full-headed gun nails or 0.148"dia.(10d) nails at 4" on center, staggered, unless otherwise noted.
12. Laminate triple (3-ply) 1.9E LVL beams (laminated veneer lumber, Trus-Joist or equal) with (2) rows of Simpson ¼" dia. x 3½" SDS screws at 24" on center, both sides. Stagger screws on both faces 12". A total of four (4) rows of screws are required.
13. Connect beams to SIP wall pocket with two (2) SIP panel screws on each side of 7.25" and 9.25" beams and three (3) screws from each side for 11.25" beams and larger.
14. Laminate built up multi-ply 2x splines with 3"x 0.148" dia.(10d) full headed nails at 6" o.c., staggered u.o.n.
15. Laminate built up multi-ply LVL splines with 3½" x .162" dia.(16d) , hand-driven nails (or equal) at 6" o.c., staggered u.o.n.
16. Connect continuous 2x shoe plate to wood framed floor system with 3½" x .162" dia. (16d) hand-driven nails (or equal) or with 0.131" dia. (8d) gun nails at 4" o.c., staggered.
17. Provide 15# rolled felt or synthetic vapor barrier over roof sheathing to provide temporary protections from the elements prior to installation of finished roof system designed and installed by others.

SOLID WOOD DECKING REQUIREMENTS

1. Material: Tongue and Groove 2x6 #2 Western Red Cedar, WCLIB Grading Rules, S4S, controlled random layup, groove side down, installed where noted.
2. Design and installation standards: “Tongue and Groove Roof Decking” (copyright 2003) by the American Forest & Paper Association, Inc. and the American Wood Council.
3. Material to be furnished and installed unless otherwise agreed in writing.
4. Fasten 2x6 decking to each timber rafter, purlin or other support in each board at each support with:
    a. (2) 3 ½” stainless steel deck screws;
    b. or (2) 16d galvanized ring shank nails;
    ~~c.~~ or (3) 0.131 x 3 ¼” galvanized, full-headed RS gun nails.
5. Fasten 3x6 or 4x6 decking to each timber rafter, purlin or other support with:
    a. 40d toenail and one (1) 60d face nail;
    b. or (2) #10 x 4” face screws using a ‘binder’ to keep the boards together.
6. Connect deck boards together at 30” on center, staggered from board to board, with:
    a. ¼” x 8” ‘spikes;
    b. or ¼” x 8 5/8” ASSY Ecofast™ screws (with 2 ¾” thread length) available from https://mtcsolutions.com
7. Fasten T&G decking to any shear walls or structure by others with #10 x 4” screws at 6” on center, in order to transfer diaphragm loads to those structural elements.
8. Overlay solid wood decking with a minimum of one layer of15# rolled felt to protect wood decking from the elements, and to provide a vapor barrier under any OSB/CDXC/Nail Base overlay. Alternatively, install a synthetic membrane under metal roofing, hard tile or slate, designed and installed by others.

OSB/CDX SHEATHING OVERLAYMENT REQUIREMENTS (To develop diaphragm shear)

1. Material: 4’ x 8’ sheets of 7/16 OSB or CDX plywood overlay on solid wood decking described above and installed where noted.
2. Fasten sheathing to 2x decking with N10d (1 ½” common nails) or 1 ½” ‘wide crown’ staples at 6” on center around all edges and at 12” on center in rows spaced ~~at~~ 24” on center.
3. Lay long axis of sheathing perpendicular to long axis of 2x decking.
4. Stagger butt joints in sheathing a minimum of 24”.
5. Provide adequate expansion joints between sheets to prevent buckling.
6. Design and installation standards: American Plywood Association
7. Material to be furnished and installed unless otherwise agreed in writing.
8. Install sheathing over solid wood decking as one continuous operation or provide temporary protection from the elements with a one layer of 15# rolled felt.

SPECIAL SHEAR WALL SYSTEMS

1. Frame walls as indicated.
2. Studs and top of wall plates: #2 SPF and 1.9E LVL material as indicated.
3. Sill plates: #2 pressure treated southern yellow pine (SPIB Grading Rules)
4. Sheathing: 15/32” minimum (5/8 indicated by architect) OSB or CDX
5. Hold Downs: Simpson (no substitutes!)
6. Fasteners: Hot dip galvanized nails where required.
9. Unless otherwise noted, fasten to solid wood framing with 1 ½” wide-crown staples at 6” on center at edges and with 8d nails at 12” on center in 24” spaced rows in field.

10. Stagger end joints of sheathing 24” to 48”.

NAIL BASE INSULATION OVERLAYMENT REQUIREMENTS

1. Material: 4” nominal 4’x8’ sheets with 7/16” thick OSB skin (one side only) and 3 5/8” EPS foam core over-layment on solid wood decking described above and installed where noted.
2. Design and installation standards: Panels should be produced in accordance with standards promoted by the Structural Insulated Panel Association and by a member firm of that association. See www.sipproducts.com for typical installation details.
3. Material to be furnished and installed unless otherwise agreed in writing.
4. Install nail base insulation directly over solid wood decking as one continuous operation or provide temporary protection from the elements with a one layer of 15# rolled felt.
5. Install panels with 3/16” gaps (recommend OSB Clips) between panels. Fill gap with three or four passes of gun-installed, low-expanding, polyurethane foam (Hilti, or equal)
6. Stagger end joints of panels 24” to 48”.
7. Fasten panels to solid lumber roof decking with with 5/8” diameter pancake heads panel screws by Trufast, FastenMaster, or equal with a minimum of 1” of thread penetration into receiving wood member (excluding points) to maximize uplift resistance.
8. Unless otherwise noted, install panels with three rows of five (5) screws at each end and in the middle of the panel. Install screws at 6” on center along ridge lines, hips, and outer perimeter of roof.
9. Unless otherwise noted, provide 2x4 inset spline around perimeter of roof fastened to skin with 8d nails at 6” on center.
10. Provide 15# rolled felt or synthetic vapor barrier over sheathing to provide temporary protections from the elements prior to installation of finished roof system designed and installed by others.

GLULAM SYSTEM REQUIREMENTS

1. Glulam components shall be produced by a Specialty Glulam Manufacturing facility in the United States with current code compliance approvals and with:
   a) demonstrated experience in the manufacture of comparably sized components for a period of not less than five (5) years;
   b) a continuous quality control program with an audit during construction and scheduled periodically after by an accredited inspection agency such as AITC.
   Bidders shall submit evidence of their current certification with the bid.
2. Glulam components shall be Southern Pine 24F-V8 layup or equivalent.
3. Appearance Grade shall be “Architectural” in accordance with AITC 110, “Standard Appearance Grades for Structural Glue Laminated Timber”
4. Sizes for the Arch Beams shall be verified by the manufacturers engineer to satisfy the design load requirements stated above in accordance with AITC Section 8.3.4, “Design Procedure for Pitched and Tapered Curved Beams”.
5. Camber is not required for the 8.5” x 33” (before trimming) Connecting Girts.

6. Components shall be pre-cut to fit (except for recesses for connection plates) in accordance with the dimensions shown herein. The selected manufacturer shall submit ~~their own~~ dimensioned production drawings for final review and approval by the Architect.
7. Housings for the connection plates will be routed and chisel-shaped by others at the jobsite.
8. Bids shall include shipment “F.O.B. Trucks, Jobsite” for installation by others including coordination of unloading by others with the Project Manager or other designated representative.
9. Bids shall include all applicable taxes and fees paid by the Manufacturer.
10. Arch Beams may be provided with internal, fully concealed moment splices to facilitate shipping to the jobsite. Two (2) splices in each beam, i.e., three (3) separate pieces per Arch Beam is recommended. The manufacturer shall provide: a) the engineering design and detailing of such splices; b) complete factory preparation and trial assembly of the connections before shipment; and, c) final assembly of the three components into a single Arch Beam at the jobsite for installation by others.
11. Every bid proposal shall be specific and enumerate all inclusions and exclusions.
12. The Project Manager will make every effort to insure that all bidders are made aware of any changes.
13. The Project Manager reserves the right to award the supplying of the Glulam Components to any bidder of his/her choosing regardless of cost.
14. All questions should be directed to the Project Manager in writing via email.

END OF SUPPLEMENTAL SYSTEM NOTES