1. **Tall spans for curtain wall:**
    a. Sometimes there is no support locations from the structure where you might expect (stair locations are some). If the structural engineer of record does not show a connection, coordination is required.
    b. Two-part open shapes do not perform as well as tube shape mullions and must be reinforce more.
    c. Lateral buckling of open shapes is an issue from the code – manufacturers sometimes advocate anti-buckling clips but have no testing to prove. Lateral bracing needs to be physical horizontal members according to code.
    d. Span heights may be more than the manufacturer stock lengths requiring ugly/expensive structural splice joints if not in spandrel.

2. **Vertical structural movement joints – (horizontal joints between stories):**
    a. 95% of contract documents reviewed require accommodation of vertical structural building movement.
    b. Accommodation of vertical structural movement (and thermal expansion) – manufacturers standard details only consider maximum ¼" of vertical structural movement – This is not enough in 100% of the projects we have worked.
    c. Structural drawings rarely give the actual amount of building structural movement which must be accommodated.
    d. The code allowance for building structural movement is L/360 which for a typical 30' steel beam gives 1" of structural movement which is too much for stick-built standard curtain wall details. Unitized has horizontal joints to accommodate.

3. **Sealant Joints at the head of curtain wall:**
    a. These joints must be designed to accommodate building structural movement.
    b. Typical design formula requires about 2x the movement (i.e. max compression of about 50%)
    c. If the code allows the L/360 for building structural movement, L/360 give 1" movement for a typical 30' beam, then a 2" joint would be required – you can only allow it to compress 50% by joint manufacturer requirements.
    d. If these joints become excessive; typically, over ¾" or 1", then custom manufactured T and F anchors may be required. Manufactured T and F anchors have very limited movement capacity inside the mullion.

4. **Jamb mullions may require extra reinforcing:**
    a. The weather sealant joint from the mullion to the structure requires design to accommodate wind deflection of the jamb mullion.
    b. It the jamb moves too much for a typ ½" joint, either reinforce mullion or increase width of joint or move to 100% movement sealant.
5. **Movement joints at the head of storefront – Receptors:**

a. 95% of contract documents require accommodation of vertical structural building movement in SF specs.
b. Architectural details are typically deficient showing shimmed head joints allowing for zero "0" structural movement.
c. If storefronts are more than 15'-18' long (horizontally), then it is likely they need to have receptors at the head.
d. Receptors only accommodate about ½" maximum vertical structural movement – actual structural movement may be more, requiring a curtain wall system.

6. Corner Modeling – 3d structural modeling should be performed:

a. Short return curtain wall and storefront sections may get pulled out by wind loads and require additional steel reinforcing to help with the joint between glazing systems and structure.
b. Minimum bite requirements at corner mullions do require checking by specifications for in-plane movement created by wind load at corners. Maximum bite loss in plane is 1/4"

7. Sunshades:

a. Significant snow and drift load may be required as loads for design.
b. Pictures and studies have shown damage to insufficient storefront mullions.
c. These loads must be modeled/accounted for in curtain wall and storefront designs.

8. Vertical Sunshades and Mullion extensions:

a. Deep cap extensions (12" or more) will add in-plane wind loads to glazing systems.
b. Manufactures have not designed their systems to accommodate lateral deflections in the plane of the glass pocket associated with in-plane wind loads.
c. Contract specifications place a maximum lateral deflection of 1/8" in the plane of the glass – which may require significant reinforcing to achieve.

9. Insulated Glass Units – delegated design may be required:

a. Some 088000 specs require delegated design submittal by PE
b. SSG units should be designed and require different spacers and secondary structural sealant design to transfer loads through IGU.

10. Door Headers:

a. Watch for long headers over entries which may require significant engineering to limit deflections and possible steel reinforcing to verticals framing the opening
b. Automatic door manufacturers have specific requirements for minimizing deflection and movement if framing to curtain wall.

Level 1 – Prelim Engineering Analysis

- Cladding design loads.
- Optimize system types for the performance required.
- Frame sizes, spacing and geometry.
- Coordinate structural support and loads.
- Flag potential code compliance challenges.

Level 2 – Drafting & Shop Drawings

- Input to Architectural Drawings and Details.
- Detailed Shop Drawings.
- Fabrication Drawings.
- BIM Models and Coordination.

Level 3 – Detailed Engineering

- Detailed engineering report of all glazing and other cladding elements with submittal and review of drawings.
- Design and detail joints for building structural movement and manufacturer limitations.
- Insulated glass unit (IGU) design.
- Determine safety glazing locations.
- Thermal analysis.
- Specifications review.

Level 4 – Structural Glass Walls

- Determining applicable design loads.
- Design and detail anchorage for glass such as point support, fin supported systems and custom solutions.
- Design and analysis of laminated and Insulated Glass.
- Coordinate and account for building structural movement between trades impacting the glass scope.

Level 5 – Post Design & Installation Support

- Answer requests for Information.
- Submittal Reviews.
- 3rd Party Design Review.
- Site Visits Inspections & Reports.
- Forensic analysis & reports

Level 7 –Other Structural Glass Applications

- Analysis and design of glass railing and support design.
- Glass canopy analysis and design.
- Laminated glass floors and stair treads/landings analysis and design.
- Analysis and design of glass wind screens and structural supports.
- Analysis and design of ornamental glass.