APPENDIX 1 –
Engineering Experience Examples by Discipline

(for engineers-in-training)

The examples contained in these appendices are grouped by discipline from a variety of experience reports. The examples for each discipline are not meant to flow together, but are a conglomeration from a variety of engineers-in-training.

In order to protect personal information, specific project names and locations have been indicated with a letter, such as X. Also, places where the applicant could have provided more detail are shown with "____".

If there is no page number beside a discipline, then we don't have any examples for that discipline yet. Refer to other disciplines to get an idea of the kind of information required.

CONTENTS

For examples in geology, geophysics, hydrology and metallogenist, see Appendix 2 – Geoscience Experience Examples by Discipline (for geoscientists-in-training)

Civil Engineering Examples

Part 1 - APPLICATION OF THEORY

Examples will be added to this section when they become available.

Part 2 - PRACTICAL EXPERIENCE

Studying / exposure to existing engineering works

- For the X project, I conducted a site visit along with the research team to the water treatment lagoon. The visit helped me visualize the overall system and to trouble shoot issues that may arise with respect to water quality testing. The water quality sensors were located in the middle of the lagoon, and on windy days it was not possible to access the water quality sensors, as such the battery life of the sensor was increased to ensure that the sensor would keep operating even if the battery could not be changed during a scheduled visit.

Part 3 - MANAGEMENT OF ENGINEERING

Examples will be added to this section when they become available.

Part 4 - SOCIAL IMPLICATIONS OF ENGINEERING

Examples will be added to this section when they become available.

Electrical Engineering Examples

Part 1 - APPLICATION OF THEORY

Analysis

- In the X project, I determined the ventilation, heating and cooling requirements for individual rooms according to ASHRAE Standard 62.1-2013. The outcome was ___ <include detail>.
- I analyzed the control system integration requirements for multiple indoor central custom air handling units at the X Pumping Station. I made use of ASHRAE Guideline 11-2009 for Field Testing of HVAC Controls Components as well as section 18 of the Canadian Electrical code that covers hazardous locations.

Design and synthesis

- I provided recommendations for a HVAC system for the Montreal Lake project, including terminal devices that served individual spaces as well as the central station equipment based upon the available electrical services, space and economical constraints.

Testing methods

Examples will be added to this section when they become available.

Implementation

Examples will be added to this section when they become available.

Part 2 - PRACTICAL EXPERIENCE

Studying / exposure to existing engineering works

Examples will be added to this section when they become available.

Application of equipment in larger systems

Examples will be added to this section when they become available.

Limitations of practical engineering

- From my participation in the collection of performance data both at manufacturing facilities as well as installations in the field I have gained an understanding of the limitations of software simulations and theoretical calculations. I have seen firsthand that even subtle differences in operating conditions or parameter changes can affect the pre-determined performance of equipment that is initially estimated using software modelling techniques. While on site at X project, I observed that the actual air flow and total static pressures measured differed from the calculations and bench testing that I compiled previously. The reason was ____ <include details>.

Significance of time

Examples will be added to this section when they become available.

Part 3 - MANAGEMENT OF ENGINEERING

Examples will be added to this section when they become available.

Part 4 - SOCIAL IMPLICATIONS OF ENGINEERING

Value and benefits to the public

Examples will be added to this section when they become available.

Safeguards and mitigating adverse impacts

- I was responsible in the X project to ensure that the distributed power generation solutions that our company was commissioning for our clients were electrically safe to prevent risk of injury, death or property damage on the secondary side of the electrical service. As well, I needed to ensure that the interconnected electrical equipment (which are AC-DC inverters) met minimum anti-islanding standards to ensure the safety of SaskPower personnel working on the electrical system in the event of a power outage or planned maintenance and construction.

Engineering activity and public at large

Examples will be added to this section when they become available.

Interest and involvement

Examples will be added to this section when they become available.

Significance of regulatory agencies

Examples will be added to this section when they become available.

Electronic Systems Engineering Examples

Part 1 - APPLICATION OF THEORY

Analysis

- For the X chemical building, I reviewed the list of chemicals and compared it with a list of corrosive chemicals to determine the building classification (Class and Division) as per the Canadian Electric Code (CEC) which would determine the wiring methods required.
- On the X project, I performed a load calculation to determine the total power requirements of all the process equipment on site. I did this by ____ <explain how you did it>. Based on the load calculation, we sized the SaskPower service that would be required, which was ___.

Design and synthesis

- For the X upgrade project, I worked on the design for two latge Variable Frequency Drives (VFDs) to be installed on the main distribution pumps (200HP and 250HP). I researched methods of harmonic mitigation for the VFD including active front ends and 18-pulse front ends. Under the supervision of a senior engineer, I developed the specifications for the new VFDs. I provided direction to the CAD staff to create electrical drawings for this project through iterations of reviews and mark-ups.

Testing methods

Examples will be added to this section when they become available.

Implementation

Examples will be added to this section when they become available.

Part 2 - PRACTICAL EXPERIENCE

Examples will be added to this section when they become available.

Part 3 - MANAGEMENT OF ENGINEERING

Examples will be added to this section when they become available.

Part 4 - SOCIAL IMPLICATIONS OF ENGINEERING

Examples will be added to this section when they become available.

Mechanical Engineering Examples

Part 1 - APPLICATION OF THEORY

Examples will be added to this section when they become available.

Part 2 - PRACTICAL EXPERIENCE

Studying / exposure to existing engineering works

- I had a much greater degree of interaction with the Operations personnel at facility X. This allowed me to better understand how the facility is operated and what challenges exist out in the field that may not seem obvious from the office. For example, I became aware of the advantage of having gate valves instead of 1/4 turn ball valves in areas that might be prone to unintentional opening/ closing due to operations bumping into them.

Application of equipment in larger systems

- I learned the importance of working with raw goods manufacturers during the design process. You can design and model products for months but it means very little if the vendors you are using can't achieve what you design. I had a lot of interaction with our metal fab vendors and worked to understand their manufacturing parameters, process, and limitations. There was some rework to be done and design changes that were necessary as a result.

Limitations of practical engineering

Examples will be added to this section when they become available.

Significance of time

- In the X project, I was exposed to both reactive and planned maintenance and have seen how both job planning and scheduling can affect the time required to repair equipment and the overall cost to repair. What happened was ____ <provide details>.

Part 3 - MANAGEMENT OF ENGINEERING

Examples will be added to this section when they become available.

Part 4 - SOCIAL IMPLICATIONS OF ENGINEERING

Examples will be added to this section when they become available.

Structural Engineering Examples

Part 1 - APPLICATION OF THEORY

Analysis

- I performed a load rating analysis on the X Bridge according to the CSA-S6-00 Canadian Highway Bridge Design Code using Saskatchewan Highway and Transportation's (SHT) primary legal truck loads to determine feasibility of widening the existing structure. Several widening options were evaluated and compared to the existing structural capacity of the hybrid steel plate girders to determine strengthening requirements. A thorough detailed analysis was required as the steel girder's material and cross-sectional properties varied along their length.
- I performed a load rating analysis on the X Bridge according to the CSA-S6-00 Canadian Highway Bridge Design Code to determine if the current load restriction of 5 tonne was valid given the corrosion and deterioration found in the bottom chord members of the trusses.
- I performed a number of load rating analysis on steel, timber, and concrete bridges throughout the province to typically determine feasibility of rehabilitating existing structures and/or as part of routine inspections.
- I performed an analysis on a drag conveyor drive coupler after a catastrophic failure. I completed the calculations required to verify that the component was not undersized or incorrect for the application. I determined that the coupler failed due to an installation error and worked to re-configure the system so that future installation errors would be less likely to occur. The result was a new type of coupling was selected and an evaluation of the guarding protecting the coupler was also completed.
- I gained experience in two new methods of analysis: direct analysis method (as described in ANSI/AISC 360-10 Specification for Structural Steel Buildings) and modified effective length method using buckling analysis (as described in "A rational approach to obtaining effective lengths of compression members in framed structures" by Dekker and Burdzik). I analyzed building trusses using the two new methods of analysis as well as the more traditional effective length method. Direct analysis and modified effective length with buckling analysis are more time consuming, but they do give more accurate results, especially for arch shaped building trusses.
- I performed structural analysis of a pre-stressed wall panel located within the X plant as part of plant upgrades to the X production system. I performed the analysis for gravity and lateral loads to ensure equilibrium conditions were maintained at all times and that the requirements for the concrete code were satisfied. Based on the results of my analysis, the modifications to enlarge the existing opening were acceptable even though there was a loss of one pre-stressing strand.
- I analyzed the complete building structure of the X project for wind, earthquake and gravity loading. The project is a four-storey structural steel building with concrete shear walls (stair and elevator shafts) for the lateral load resisting system. I performed analysis by hand for gravity and lateral loads prior to modeling the complete building to run the software analysis. I found that software analysis confirmed my hand calculations which gave me a high level of confidence in the results.
- I performed a complete building analysis for the X Building. The building is a 70+ year old wood and glulam structure. Parts of the building had experienced settlement of nearly 250mm and large cracks were observed in several of the roof glulam beams. My analysis indicated cracked roof beams were not sufficient for current now loading and cross bracing the corners of the building were insufficient for wind and earthquake loading. These deficiencies were submitted to the building owner in a report and upgrades were subsequently performed.

Design and synthesis

- I designed the strengthening details for the widening of the X Bridge. Strengthening consisted of bolting steel plates to the top and bottom flanges of the hybrid steel girders and bottom flanges of the floor beams, attaching nelson studs to the top flanges of the hybrid steel girders to make the girders composite with the concrete deck, and modification of the cast in place concrete girders in the abutment spans.
- I carried out the full design of two new building lines for client X. The "A Series" is an arch shaped building for spans of 30' to 30', while the "J Series" is a gable style building with spans of roughly 120' to 200'. While I relied on input from my supervisor for various aspects of the design, I completed the full design from building frames and bracing right down to each and every connection. I worked with AutoCAD technicians as they modeled and detailed all of the building components.
- Following the analysis I completed above, I designed the lateral load resisting system for the four-storey X building located in X. I performed the design using reinforced concrete theory as described in the concrete code (CSA A.23-04). The design had to incorporate both wind and seismic loading as required by NBC 2010. I successfully detailed the design to accommodate a typical wall thickness and reinforcing (for ease of construction) while allowing for unusually large elevator openings at several locations.
- I designed the reinforced concrete floor slabs as part of the X renovations. I utilized the common slab design software SpSlab to verify the design after I completed the initial design by hand. I found the software was especially useful when calculating deflections of the two way slab system. During construction, I re-visited the design several times to perform specific calculations relating to the loading of construction equipment of the slab. Following these calculations, I issued specific instructions to the contractor allowing a specific piece of equipment to operate on the slab within specific operating requirements.

Testing methods

- I participated in several bridge deck testing programs for client X on project X. Deck testing consisted of delamination testing by chain-dragging, procuring concrete powder samples for chloride testing, concrete cover testing using electronic cover meter, and CSE testing (copper sulfate electrode testing).
- I arranged for and participated in the Magnetic Particle Testing of a 5 span steel bridge near X for Saskatchewan Highway and Transportation. Testing program was required after a previous inspection I performed found fatigue cracking in several welds on the horizontal bracing affixed to the bottom flange of the main girders.
- To verify the increased capacities we determined using direct analysis and the modified effective length method, we performed destructive testing on a number of our building trusses. My role was ____. The theory was proved to be correct, and it allowed me to gain an appreciation for the various load and resistance factors that are utilized in specimens and assisted the lab technician as he carried out the tests.
- I reviewed concrete test results for the X building in Lloydminster to ensure the concrete being supplied was achieving the strength specified it the project specifications. In addition, I wanted to see concrete strength test results prior to heavy equipment being placed on floor slabs. Based on the test results, I would determine whether the equipment could be allowed on the slab.

Implementation

- I performed life cycle costing analysis on several bridge structures to determine the least cost alternative for several rehabilitation options and performed maintenances and rehabilitation evaluations for many bridge structures for client X and client B as part of their typical routine inspections. One example project specifically was ___.

- When the first "A Series" building was sold and installed, I got the opportunity to make two site visits to the building. I was able to interact with the crew about issues they had during installation as well as just appreciate the result of our months of work.

Part 2 - PRACTICAL EXPERIENCE

Studying / exposure to existing engineering works

- I provided site inspections for several projects that were designed by our office. This work entailed checking accuracy of reinforcing steel placement, concrete placement/finishing, quality assurance, and other construction practices to ensure contractor's compliance with contract plans and specifications. Projects included; X Bridge Rehabilitation, X Culvert Replacement, and X Bridge Overpass Construction.
- I performed numerous routine visual inspections on steel, timber, and concrete bridges to determine material and performance defects for local, provincial, and federal public agencies. Inspections were carried out either according to Ontario Ministry of Transportation Bridge Structure Inspection Manual (OSIM) or other proprietary bridge management systems.
- I performed specialized detailed inspections that included destructive and non-destructive testing methods on several bridges and building structures throughout the province. Projects included; deck testing for X, detailed investigation of the X Bridge Piers for client X, Magnetic Particle Testing for X Bridge, structural assessment of X.
- I performed a number of building installation inspections to verify that the buildings were installed according to the original design intent. This inspection is required in Alberta for the building permit application. The majority of the buildings that I visited were to be used for storage facilities in the oil/gas sector.
- All of our manufacturing is done at the site I work out of so I am able to work closely with the welders as they work on custom projects or product development. This allows us to have constant input about the feasibility of our designs.
- I investigated water found inside members of the open web steel joist in the X building located in X. As part of the investigation, I drilled 1/8" diameter holes near the bottom of the tubular joist members. This drained any standing water inside. I then chose four tubes that contained water and reinforced those prior to cutting them to view the corrosion. The corrosion was minimal (some surface rusting) and a subsequent structural analysis indicated the surface rusting was not an issue. I then wrote a letter to client X summarizing my findings with a recommendation that the joist be monitored for further corrosion and moisture. The source of water in the members was not determined; no water has been observed since.
- I performed a complete building inspection of the X building prior to my analysis and design work there. My inspection was a visual examination of the glulam beams and columns, timber braces, and masonry walls. I measured crack widths and noted any rot or deterioration. My inspection revealed several areas in need of remedial work which I addressed in a report and subsequent analysis and design. As a whole, the building was in remarkably good condition which spoke to the initial engineering design choices that were made; in particular, the use of wood in an environment where other materials tend to corrode and deteriorate.

Application of equipment in larger systems

- The role of computer software is vital in all aspects of our work; I use SAP 2000 structural software as a design and analysis aid when performing member analysis/design, I use Haestad's Culvertmaster software when analyzing existing hydraulic conditions and for designing the viable alternatives for a culvert replacement, I use Microsoft Excel as a calculation tool for performing repetitive calculations for structural analysis and for cost estimates for construction and fees.

Limitations of practical engineering

- I have an understanding of the limits practical engineering when using testing equipment and techniques. Care must be taken and strict procedures must be followed in order to produce reliable and reproducible results so that the results can be accurately interpreted by others in order to achieve the desired results. An example from my work experience is ___.
- I provided engineering support for the replacement of a failed drive coupling on site. Some of the limitations encountered on this job were: the space required for access with tools and positions of people around, when assembly a component in the field it is not always easy to check tolerances when in a loud and vibrating environment such as a running mill. Also when field welding it can be difficult to keep the prepared area clean for ideal penetration and weld quality.
- I understand the limits of practical engineering when it comes to finite element analysis (FEA) programs such as STAAD.Pro. The results can only be as accurate as the input, so engineers must take care to ensure that they model represents real life loading and conditions as closely as possible. This issue arose when we were doing destructive testing on our trusses. Even with the precise material thickness and yield strengths from the mill certificates, we were still finding failure loads that were higher that what I determined with STAAD. We eventually determined that although the FEA model had pin support conditions, the actual connections, although not fixed, gave a slightly more rigid support. Once we modified the STAAD model, the results matched the load test.
- As part of the X project, I detailed two unique pile cages with a custom pile cap as part of the main stair support. During piling, the wrong pile cages were installed and the detailed stair support was missed. I was able to accommodate the stair support with the structural slab; however, the experience provided an excellent illustration of how using typical details throughout a project greatly increases the reliability in the field.
- A feature of the X project was a steel trellis above an outdoor seating area above the main floor. I designed the trellis to be free standing with a combination of moment and pin connections for the steel members. Unfortunately, because many of the connections were bolted to suit the hot dipped galvanized steel, the actual erection of the structure was very difficult and fabrication tolerances tended to compound over the length of the structure, resulting in a large bow that was difficult for the contractor to fix. Although bolted connections worked well structurally, they were not ideal, in this case, for field erection.
- While inspecting the piles and piling operation for the X project, I saw how difficult it can be to install drilled concrete piles in different soil conditions. I saw the auger bind several times when drilling through hard clay in project X which significantly delayed the drilling process. In other cases, the length of pile had to be adjusted to accommodate sand lenses and sloughing when bells were formed, such as in project Q. Seeing these difficulties on site allowed me to understand the recommendations in the geotechnical report much more thoroughly.

Significance of time

- I was involved with the writing of proposals and estimating of engineering effort to complete proposed projects. This included determining available resources, calculation of man-hours, and scheduling to ensure that the project can be completed on budget and within the given timeframe. My role was ___.

- The X tailings impoundment facility, is a weather and time-dependent system. Adverse weather, such as high winds, large amounts of precipitation and freeze-dry conditions, as well as the time of year (i.e. summer vs. winter operation) are all taken into account in the deposition planning and daily operation of the tailings facility. I was made aware of the significance of time from the daily and seasonal changes to operation, including dust control, the increase in the addition of lime to the system (both changes in volume and location), changes to the flow of the treated effluent and changes to the tailings deposition location.
- Budget is one of the most important aspect of a project, but next, if not equally as important is timing. Whether it is because a project quote and drawings have to be provided in time to submit for board approval, or because a building must be on site and installed within a planned plant shutdown, I can appreciate the significance of time. A specific example would be _____ where ____.
- I completed all contract administration work for the X project and often had one day to review and return shop drawings to maintain the construction schedule. This forced me to prioritize my daily tasks and focus on completing the most urgent first. It was necessary to develop a running list, updated daily, to assess the most urgent tasks and keep me productive with other projects as well.
- I took responsibility for the management of the construction, implementation, commissioning and completion of the installations of the systems sold under signed contracts with home owners, farms and businesses. This included careful cash flow management to unsure that constructions milestones were achieved to trigger process payments to maintain sufficient cash flow for our company. Timing and adhering to deadlines was imperative for the success of the projects in the following manner: 1) seasonal dependence: certain components of the project needed to be completed prior to freeze up. I attempted to minimize the impact of seasonal periods by managing the design and implementation of helical pile foundations instead of concrete so that sub-zero temperatures would not extend foundation construction and concrete cure times. 2) Sequential order and significant lead times: I managed the longer than normal manufacturing lead times of the nacelle, generator and blades in addition to the time for SaskPower to execute the requested Preliminary Integration Study (PIS) for each project that required a grid interconnection. 3) Cash Flows: I managed the cash flows associated with our contractual obligations to our customers that we receive payment based upon achieving set milestones. This needed to be balanced with expenditures of cash and labour to reach these milestones on time and on budget. It was detrimental to expend cash and resources but not achieve milestones as then a cash deficit occurred which reflected poorly on our monthly financial reporting.

Part 3 - MANAGEMENT OF ENGINEERING

Planning

- I have been involved with the planning of many projects from inception to completion. For example, for the X detailed bridge inspection; I wrote the proposal and prepared the fee estimate that won us the job, prepared the inspection plan, organized the manpower and equipment to perform the inspection, led the inspection, performed the load rating analysis, wrote the final report, and assisted with its presentation to our client.
- I worked with the purchasing, detailing, and manufacturing to come up with costing and timelines of projects during the quoting phase. Communication between all departments is especially important when we were quoting on a very large project or a project that was in some way out of the ordinary for us. An example of this was the X project where ____ <include outcome>.
- As part of the vault removal for the X project, my supervisor and I prepared a work plan (sequence) for the contractor to complete the work. Because one of the vault walls was a load bearing wall, lintels

had to be installed in the wall prior to the lower portion being removed. This involved a highly coordinated effort between the trades to cut the existing wall, install the steel, cut and remove vertical sections on the wall to install steel columns and then remove the wall from under the new steel support system. I reviewed the work plan with the contractor and visited the site throughout the process to monitor the progress and answer any questions or concerns the contractor may have. The wall was successfully removed as planned.

Scheduling

- As part of the proposal process, I developed detailed schedules for completion of our services. The development of these schedules ensured client's project delivery dates would be met and assisted us in the preparation of the cost estimates for our engineering services. A specific example is ____.
- Due to the complexity and issues revolving around manpower, it took a concentrated effort from everybody involved to keep the project moving forward to meet the scheduled turn over dates. Manpower onsite was increased to accelerate when some systems fell behind and night shifts and weekend shifts were added when necessary to decrease congestion in work areas and to advance schedule and lagging tasks. A specific example is ___ where ____ <include outcome>.
- More often than not, I'm working on a number of projects at a time (up to X projects at once), as well as having normal day to day activities. Scheduling my time so that everything gets done when it's supposed to, is essential.

Budgeting

- As part of the proposal process, I developed detailed cost estimates for our engineering services for a number of clients. These cost estimates, while competitive, included our fess required in order to complete all aspects of the proposed project as outlined in the Request for Proposals. After the successful award of a project, I calculated preliminary budgets for presentation to the client for completion of the proposed work. These budgets included contingencies, general requirements, and contractor overhead and profits. As projects progressed towards tender stage, I constantly adjusted these detailed budgets as quantities and unit costs were updated.
- I build and maintain budgets for the project mentioned in the report. This involved working with the purchasing department to obtain fabrication estimates and costs of procuring the required equipment. In addition, I also worked with the maintenance crew planner to estimate the man hours required to determine anticipated costs for installation. The project I was working on was part of a larger capital budget, so I also ensured the costs would be appropriate for the capital budget as well.
- I prepared a preliminary budget for the structural cost of the X project prior to the project being tendered. The structural budget was necessary to ensure our design fell within the owner's overall budget for the project. I prepared the budget by calculating quantities of steel and concrete for the project. I then multiplied the quantities by dollar values we have typically seen on past projects for similar structural systems using steel and concrete. I found our estimated structural budget was within the amount allotted for the structure and we made no design revisions. Additionally, after the project was tendered, I compared my tendered numbers to my projected numbers and found the two values were within several percent of each other.

Supervision

- As a project manager, I was responsible for the successful completion of __ <number> projects during this reporting period. This required the coordination of __ <number> other employees within our department and the allocation of our resources. This typically involved the supervision of

technologists for drawings and calculations, and intermittently providing technical assistance to other engineers when required.
- I was required to fill in for the site chief engineer during his time off. This accounted for approximately 10 days per month. My added responsibilities included: lining up work for the junior engineers and technicians, reviewing their completed work and scheduling day and night shift manpower. I was also responsible for attending the managers meeting to coordinate work with the other departments and client contract meetings to present the department's progress.

Project control
- As a project manager, I was in control of numerous projects through all phases of the work until its completion. As a client's representative, I monitored and controlled project progress through chairing of weekly/bi-weekly construction meetings and enforcing the contract specifications to ensure that the contractor would complete the work within the project schedule and remain within the client's budget. As my company's representative, I ensured that our project team stayed within our allocated budget through monitoring costs/expenditures and by assisting with the preparation of monthly invoices to our clients.
- The past 24 months have given me a much greater appreciation for change management and budgeted vs actual costs. As we were overseen by an EPCM company, one of my primary duties was to prepare requests for change orders, field work instructions and design initiation requests to deal with changes on the work site. It was vitally important that I followed strict procedures wherever there was a change that would lead to a cost or schedule impact. I was also required to track actual costs and compare to the original budget and justify whether any costs over runs were justified by the contractor or not. I also gained a greater awareness of tracking delays and the importance of addressing delays in the contract document, such as, in the X project where ____ <explain what happened>.
- I become involved with the X renovation project after the building owner relieved the previous structural engineer of his project obligations. I was responsible for providing structural solutions to suit the owner's floor plan as well as addressing structural conditions discovered on site. I worked with the contractor to develop a plan that allowed the store to remain open and allowed the contractor to complete the work in a series of steps. The structural design concept was developed on site with input from the contractor regarding feasibility of installation and capabilities of his company. Although the project timeline was longer than the owner initially desired, the project was successfully completed and the building owner was satisfied with the finished project.

Risk assessment
- *Examples will be added when they become available.*

Part 4 - SOCIAL IMPLICATIONS OF ENGINEERING

Value and benefits to the public
- The value and benefits of engineering works to the public of the many of the projects that I have been involved with, ensures that the bridges and structures that we inspect are safe for public use. These projects have provided me with a heightened awareness of the potential consequences of our work and the effect it can have on the public. For example, the x Bridge detailed inspection led to the recommendation of temporary closing the bridge to vehicular traffic until certain repairs could be made to key components of the trusses. The analysis also needed to include an assessment of the bridge for pedestrian use only to ensure the safety of the traveling public.

- The X project will enhance the delivery of educational services for the grade k-8 students. Designed with many energy efficient concepts and elements, it will be a comfortable and inviting place of learning. I had the opportunity to design several interesting structural components within the building such as the stairs and front entrance canopy. The structure, together with furniture that will be supplied to the building, is intended to create a curiosity in students that motivates them to ask questions and learn. Additionally, being a school, it is designed with high importance factor which means it is designed for higher snow and wind loading to potentially allow for the school to be a place for shelter following a severe weather event.

Safeguards and mitigating adverse impacts

- For our clients that are public agencies, I provide additional benefits to the public with the value engineering we provide as every detailed investigation typically is accompanied by a life-cycle cost analysis, providing our clients with the most viable, least cost alternative.
- I have become more aware of the need for safeguards when it comes to building occupant safety, specifically handrails and guardrails. I was asked to investigate handrail and guardrail components for balconies located on the X project. The handrails installed on the balconies were loose and deflected considerably under the weight of one person leaning against them. While investigating, I found the handrails were not installed as per the stamped engineered drawings. Critical pieces of wood blocking below the deck were left out which prevented the handrails from being securely fastened to the structure. I performed and analysis to determine the capacity of the handrails as installed and found them to be capable of resitting less than one half of the required loads for a guardrail as per part 4 of the National Building Code. I instructed the contractor to install the blocking and fasteners as specified in the original drawings to bring the structure in compliance with the code. This investigation made me aware of how important inspections by the structural engineer are in assuring the design intent is carried through in the field.

Engineering activity and public at large

- *Examples will be added as they become available*.

Interest and involvement

- Through several courses that I have taken with the Saskatchewan Construction Association along with our company's own health and safety policies, I have gained an excellent understanding of the provincial's occupational health and safety requirements necessary to ensure the safety of fellow employees and the general public on each project we undertake. For example, at the initiation of each of my projects, I am required to fill out a project Risk Management Safety form outlining the potential job hazards, required personal protective equipment and precautionary measures that may be required to complete the work. Additionally, I protect the public's interests by enforcing the contract specifications for each project undertaken as they pertain to health and safety (i.e. work zone safety, tail gate meetings, hazardous materials, emission controls etc.).

Significance of regulatory agencies

- I have developed an appreciation of the role of regulatory bodies on the practice of engineering. These agencies provide the minimum guidelines that must be met to ensure the safety of the general public. For example, using the CSA-S6-00 Canadian Highway Bridge Design Code and National Building Code in limit states design ensures that the correct load factors are used in order to safeguard the public. For example, as I perform a load rating analysis on X bridge, I used the appropriate modification and load factors to ensure that the structure can safely carry the loads placed upon it, while taking into consideration the current condition state of the member/component under investigation.

- While working with piping material specifications I gained an appreciation for regulatory agencies such as ASTM and ASME. These groups have put in significant man hours researching acceptable tolerances such as maximum operating temperature and maximum allowable pressure for materials to ensure that they do not fail under normal operating conditions. Through these tests they have also summarized what normal operating conditions are. Provided these conditions are followed, I as the engineer can be confident that the material I am using will perform in the expected manner.
- APEGS is a significant regulatory agency. The professional designations and seals are used to identify which documents and drawings were performed or supervised by a professional. This is to ensure that the quality of the work is to be expected from an experienced engineer. It is also to signify that the professional has accepted responsibility for the document.
- Client X's requirement of the Field Review form is an excellent way to ensure practicing engineers actually view the work they have designed for the client. Although I don't personally complete the form as I do not have professional designation, I believe it is best when the engineer who designed the structure is able to view it during construction.