

APEGM Progress Report for: #35240 - Brett Carels EIT

Period beginning: **Mar 1, 2015** and ending: **Aug 31, 2015. (6 months)**

Submission Date: Oct 10, 2015
Supervisor: Kyle Shymko P.Eng. (#24532), Submitted on Oct 13, 2015
Period Employer: Barnes & Duncan
Job Title: Municipal Designer

1. Give a description of the Engineering work experience you have obtained during this reporting period. Include information supporting the rest of your answers.

Below is a short list of some of the projects I worked on during this reporting period.

St. Andrews Airport, Light Aircraft Hangar

This project started as a proposal which I wrote about in my previous E.I.T. report. In February I started work on the grading design and service plan for the light aircraft hangar, taxiway, office building, truck loading bay, and parking areas for Northway Aviation's new facility. During the design phase I worked with our own office staff as well as the Design-Build Manager, project Architect, Structural Engineer, Mechanical Engineer, Electrical Engineer, and Steel Frame Engineer. In May the design portion of the project was coming to completion and construction was starting up. The construction is ongoing but has allowed me the opportunity to perform quality assurance on the grading. I worked with the contractors and Project Manager to work on solutions for portions of the project that were overlooked in the design phase. From our office I was in charge of preparing layout files for all aspects of the project from pile layout, gridlines, to internal plumbing. I also checked field data to insure layout continued as per the design. I have been to site multiple times for advisory meetings as well as providing elevation layout and confirmation of work performed. At an early stage in the construction process I mitigated financial risk by proposing to provide layout and quality assurance based on an hourly cost instead of the fixed fee in our proposal. This allowed Barnes & Duncan to provide field services as requested instead of negotiating any work that was added or removed from our scope of work.

St. Francois Xavier, Daycare

This project included design and assistance during project tender. Similar to St. Andrews Airport the project started with a proposal and moved forward into design. I worked closely with the project Architect as well as the project Board Members to adjust the Site Plan to meet the changing needs of the proposed day care. Prior to design, the site required investigation into an abandoned septic field located where the proposed building and parking area were. I took a key role in researching environmental concerns for the abandoned septic field. The design included grading for the building, parking area, play area, vehicle access to the highway and connections to existing walking paths. In addition to grading the design also involved a service plan. Some complications that we came across during design included: the site was located in a flood fringe area which required the site to be raised with suitable fill material. The basement for the building was deeper than expected and required a two stage sewer service system to comply with the RM of St. Francois Xavier low pressure sewer and allow plumbing fixtures in the basement. Both complications required coordination with the Architect and Mechanical Engineer. In addition to the design, a drainage report and model was prepared for, and approved by Manitoba Infrastructure and Transportation.

Chevrier Church

This project included a proposal phase and an early design phase for the addition and renovation of an existing church in Winnipeg. The proposal phase was longer than most of our projects and included multiple submissions, I worked closely with my Manager on this proposal to clearly define our scope of work and mitigate potential risk, as we have had complications with the Architect in the past. As per most of our designs, the design included grading for the building and parking areas as well as a service plan for the proposed addition. The concept design phase also required project cost estimates, cost reduction suggestions and strategies, and a stormwater management model that complies with the City of Winnipeg's requirements.

Manitoba Housing Projects

There were three projects for Manitoba Housing during this reporting period. First was a proposal and design for postnatal facility for lower income families. Second was a design for a multi-storey housing facility for lower income families. The third project was a proposal for a combined lower income housing facility and boarding for University of Winnipeg of Students, although not part of this report this project is now in a design phase. I worked closely with the project Architect, Structural Engineer, Mechanical Engineer and Electrical Engineer to provide multiple progress submissions to Manitoba Housing. Each submission (30%, 60%, 90%, Permits) is accompanied by a meeting at Manitoba Housing and a thorough review by their staff. For both design projects I presented multiple options for roof drainage systems as well as a short list on pros/cons for each. Manitoba Housing is internally divided on roof drainage and I was thanked by multiple representatives after the meetings for my clarification and brief presentation. The designs all include grading design, a service plan, and a stormwater management model.

Archibald Condominiums

This project included a proposal, design and construction assistance of two condominiums in Winnipeg. The design for the project was complicated as the site received a low drainage coefficient from the City of Winnipeg. The direct results from the lowered drainage coefficient are: the site has to store a lot of stormwater runoff during and after rainfall events, the site has to release the water to the City's infrastructure at a significantly reduced flow rate, and the grading has to be able to accommodate the storage of stormwater without impacting the functionality of the site. In addition to the design the developer also requested earth movement volumes for the topsoil, clay, silt, sand, gravel and clay bricks that were located on site. I completed the volume estimates using an add on to Autodesk and the information provided in the Geotechnical Report, this was the first time I built an existing 3D subsurface model for volumes that was more complicated than average depth of material offsets. During the construction phase I discovered I held one offset value for the building locations while our legal survey department held a different offset value. The result was the buildings on my plans were about 450mm different than our legal survey departments. The origin of the discrepancy was an error on an Architecture Site Plan. Although I flagged the Site Plan error early on, the developer did not act on my recommendation. The end result was I updated my plans to match the piles that had already been installed on site. Construction has since moved on without further complications.

Edison Condominium

This project included layout and quality assurance during the construction of one of my previous designs. My role on this project was to set grades in the underground parking area, revise grading plans to accommodate changes from design catch basin elevations to installed catch basin elevations, and to provide alternative drainage safety features for the lowered parking area. I worked closely with the Planning and Water and Waste City Departments, Contractors, and Mechanical Engineer to provide a product that met the City's requirements but also provided enough drainage safety that all parties were satisfied.

Rosser Trucking Facility

This project included preparation of volume estimates, layout files, surface models, quality assurance,

and machine control files. The project is a Design-Build in which we prepared the grading design and service plan in 2014. The Design-Build Manager and Contractor suggested and implemented multiple changes to the Site Plan throughout construction, which complicated the movement of materials as the revised designs often conflicted with previously completed site grading. I worked closely with our field staff to insure all field crews going to site understood the work and had the latest versions of the design and layout files.

Pembina Restaurant

This project included the design of a second water service line and the construction of a new sidewalk on Pembina Highway. The water service design was completed without complication and was approved by the City. The sidewalk design and rising was required for accessibility as the building under renovations had 4" risers at all entrances. The sidewalk design required coordination with the Developer, City of Winnipeg Public Works and the contractor. The water service and sidewalk both went to construction and will be included in my next progress report.

Application of Theory

Analysis

Prior to starting any project I perform a quick analysis of the information available. This often includes acquiring data from the City for what underground infrastructure exists in the area, the age and condition of the infrastructure, applicable flood protection levels and requirements, the allowable drainage coefficients for the project, a quick analysis for how difficult the design will be to complete based on the drainage design constraints, if we have any past information on the project or neighbouring properties, etc. If the design is outside of Winnipeg I will touch base with the Rural Municipality (RM), MIT and Water Stewardship, and depending on the area the Planning District (example Red River Planning District) for what they are expecting on the design. In many cases the RM's standards are similar to Winnipeg. MIT and Water Stewardship each have their own criteria for stormwater, which I will quickly analyze if our property can comply with. Similar to past reporting periods I completed multiple stormwater analyses for various projects in Winnipeg, RM's, and along major Provincial highways and/or roads.

Design and Synthesis

I was the lead designer on approximately 15-20 designs and assisted or independently reviewed at least as many. I am continually improving my design skills, and worked on mentoring our summer student and newer designers.

Testing

I reviewed a co-workers project where they tested newly installed water mains and water services. During testing the water mains would not hold pressure. The problem was a couple of corporation stops were not installed correctly. This was useful for me to see as it reinforced the importance of inspection and testing during construction. On my own project I reviewed compaction results for grading, and reviewed sewer/land drainage inspection videos. I reviewed the City of Winnipeg standards and specification for surface works and underground utilities.

Implementation

On many designs I prepared multiple design alternatives for cost/benefit analyses, optimizing site drainage, safety considerations, and ongoing maintenance evaluations. Some examples include multiple design options for the Chevrier Church parking layout, roof drainage options for the Manitoba Housing Projects, and the addition of spillover drain for the Edison Condominium lowered parkade.

Practical Experience

Site Visits and Inspections

Throughout the reporting period I regularly went on site visits and inspections. On most projects I checked the grades on site, the location of water valves, catch basins, pipe restrictors, culverts, etc. I went on multiple inspections with our Engineers for the final inspection of commercial projects prior to the City of Winnipeg releasing security funds. One of my projects that was substantially completed in 2013 still had minor deficiencies that the contractor was dragging out. During this reporting period I had two walkthroughs with the contractor and one official inspection with the City after all works were complete.

Applications of Equipment

In addition to using a computer and AutoCAD Civil3D for every one of my designs, I also prepared layout files and machine control files for graders, CATs, etc. I work closely with our field staff to provide dynamic layout files that provide the required information for underground and surface layout, but still provide enough flexibility for the field staff to deviate in the field should unexpected conditions exist. The files need to function with all of their equipment including but not limited to: total stations, GPS and Robots.

Limitations of Practical Experience

As I mentioned earlier Manitoba Housing was divided on roof drainage, specifically which method was the most efficient during rainfall events and for long term maintenance and functionality. The side of their office that was opposed to using roof drains based their opinion on a single photo from a roof inspection. The photo showed ponding around a roof drains days after a rainfall event. The condition that allowed the ponding to exist was poor maintenance procedures for their roof drains. The problem was fixed by clearing the debris from the roof drain inlet. Even with the knowledge of the solution, certain departments banned the use of roof drains on any of their future buildings. The anti-roof drain opinion started to fade after I presented the alternative options for roof drainage, and based on my own experience, presented the benefits of a roof drain system.

Opportunities to experience time constraints

Design time constraints are present on just about every project. On a couple of subdivisions we had to complete design work by a date or else the project would have to start from ground zero as the developer was slow to start the process. During construction of a large underground storage tank the developer opted for a cast-in-place tank which took over a month to complete, the alternative would have been pre-cast concrete box culverts. Although we did not get a chance to see the box culvert option go to construction, it was expected to save weeks on the project which they are now looking to make up for. The same project experienced delays with water main failures during the testing procedure.

Engineering Management

Planning

I work closely with my direct Manager as well as ownership for planning of projects and delegation of office work. A lot of focus lately has been on planning for a larger project while maintaining regular workflow for our small and medium sized projects. This is a balance with my Manager who is writing proposals for the larger studies while I focus on projects that last from a week to a couple of months. As we are a small company there is a fine balance of chasing new work while still having staff available to complete work we are already committed to. The balance right now is a couple of staff are very busy, while others go through peaks and lulls, during the lulls there is a chance to assist the people who are somewhat overbooked.

Scheduling

Scheduling can be summarized by proposal where I identify when key project deliverables are required

and when staff will be available to work on the project. As we are a smaller department, staff availability can become very crucial as staff can be overbooked quite easily if too many projects proceed with similar deadlines.

Budgeting

I do 95% of my project budgeting and billing at the end of every month. As such it has become very important for me to be aware of how much budget is left on each project to track how the design is progressing along with the intended schedule we made during the proposal phase. This allows me to adjust future proposals and track every project I am involved with. It has become crucial to identify and acknowledge scope changes and work increases as soon as possible. We have found that, if issues are brought to light too far down the project, it is often hard to bill for scope creep or work completed long ago that was outside of our scope. Projects in construction phases have been easier to budget for and bill as they are mostly completed on an hourly basis.

Besides actual project billing I perform a budget on every proposal I write. As many of the projects are under \$10,000 in civil design fees my knowledge based on past projects has become critical for knowing an appropriate fee per project. In the past I have had to work on projects quoted by others where there was no risk assessment performed for the type of work, location of work, and clientele. These are the three leading factors for a project blowing over a set budget where the variables should have been known and accounted for.

Supervision

I have worked as a supervisor in the office and field environment. In the office this often includes the delegation and review of design projects, which I perform on a daily basis. The office side often includes knowing how busy everyone is to try and distribute the work evenly. Because there are several tiers of experience the work is often not distributed as evenly as it could be but this is a work in progress. In the field I have supervised field layout and data pickup.

Project Management

In general I manage my own projects. This includes completing design work to meet submission dates, organizing field crews for data pickup and layout, monitoring project budgets and work scope, and completing required inspections as projects progress into construction phases.

Risk Assessment

Risk Assessment takes place on every fee proposal prepared by our office. Each project is reviewed for possible complications with our work, accounting for who the developer/contractor is, and potential financial risks for missed deadlines or failure to complete the work. Ultimately we use a go/no go procedure, where if someone in our office presents a case where they feel the risk of a project outweighs the benefit, the remainder of the team will consider their input and make a group decision. In the past this has been used to pass on work that is out of province or to not bid on projects with certain Developers and Architects.

In addition to proposals I also attended a safety course where we identified tasks performed by Barnes & Duncan and spent the afternoon assessing the risk associated each task under the theory that 20% of the tasks contain 80% of the risk. The assessment was heavily focused on field tasks which covered driving vehicles, using power hand tools to helicopter drop-offs and repelling for remote work sites. The analysis was performed with Safety in mind as well as potential consequences for supervisors, management and ownership should a workplace injury occur. The course was the first steps for Barnes & Duncan becoming COR certified.

Professional and Ethical Responsibilities to:

The Public

My job is to ultimately design grading plans, drainage networks, roads, and underground utility lines for the public to use. The designs I work on don't pose a huge risk to the safety of others but there is still a potential for misfortunes and I take great care to recognize, plan for, and avoid dangers to the public. This can be as simple as designing gentler slopes on the side of a road in case a car was to steer off the road, shallower ponds with gentler slopes, retaining walls with easy exit points and safety rails, to something as simple as avoiding steep slopes on side yards in the City of Winnipeg. As a designer and reviewer of other people's work I have a responsibility to the public to be aware of potential hazards in our designs and to implement solutions that are less risky.

The Profession

I regularly promote and represent the profession through my work in the office and my volunteering outside of the office. As Barnes & Duncan also provides layout services for other consultant's designs I have had multiple occasions where I identified errors or scope gaps in work performed by other firms. I show a professional responsibility to those consultants when I contact them to first let them know I reviewed their project as part of layout procedure, and secondly when I inform them I may have found an error or typo. The process has gone smoothly to date.

The Client and/or Employer

My employer gets my full professional attention when I am at work. I often stay late, come in early and the odd time go in on the weekend to meet important deadlines that would be missed otherwise. Although I do some of this without the desire to, I feel a professional responsibility to our clients and my office to represent us appropriately and deliver what we agreed upon. Ethically I double check my designs prior to the office reviews by others and I ensure that the review by my co-workers is sufficient regardless of deadlines and time constraints.

Co-Workers

It is my goal at work to improve and add to my own skillset as well as mentor and develop everyone I work with. For the summer students and new employees it can be as simple as offering tips for improving their design process and constructive criticism of their work. As I design and review work I am aware how the relationship between designer/drafter and reviewer can sometimes be strenuous. I continually bounce ideas back and forth with the E.I.T. I work with, and work towards a stronger workflow procedure. I show him a respect of his abilities and acknowledge aspects of his work demeanor that I am looking to replicate. The Professional Engineers I work with help me to continue to improve as a young professional as they pass on their technical writing skills and inspection/construction experience. In the future I will be working with them to improve their design skills in a smaller company, where it is not always to realistic have a designated drafter.

The Environment

As an industry standard all Engineers owe a duty of responsibility to the environment. Many of my designs are relatively clean and pose little risk to the environment; however I do consider the environment on every design. In rural settings I often focus on controlling water runoff so the post development site functions as close as possible to the pre-development conditions. This is important to prevent topsoil stripping and for the larger ecosystems my projects are a part of.

Supervisor Agrees.

2. Please check the following options that apply:**2.1: During this reporting period, I have applied theory in:**

- ✓ Analysis/Interpretation
- ✓ Project Design/Synthesis
- ✓ Testing/Verification
- ✓ Implementation

Supervisor Agrees.

2.2: I have obtained experience by:

- ✓ Studying or being exposed to existing Engineering works
- ✓ Applying Designs as part of larger systems
- ✓ Experiencing the limitations of Engineering designs
- ✓ Experiencing time as a factor in the Engineering process

Supervisor Agrees.

2.3: I was exposed to the following areas of Engineering management:

- ✓ Planning
- ✓ Scheduling
- ✓ Budgeting
- ✓ Supervision
- ✓ Project Management
- ✓ Risk Assessment

Supervisor Agrees.

2.4: I was required to make decisions based on professional and ethical responsibilities to:

- ✓ The Public
- ✓ The Profession
- ✓ The Client and/or Employer
- ✓ Co-Workers
- ✓ The Environment

Supervisor Agrees.

3. Describe any activities that have improved your Communication, Teamwork, or Interpersonal Skills in the following areas:

Oral Presentations:

Presented to Manitoba Housing as well as in many project meetings.

Written Documents:

Worked on multiple drainage reports, reviewed a design development report and a subdivision summary report.

Interaction with Others:

Interact daily with coworkers, ownership, the City, developers, contractors and the public.

Other:

Supervisor Agrees: Brett interacts frequently with external clients without supervision.

4. During this period, I had to consider the social implications of my work in the following areas:

Working on the Manitoba Housing projects it opened my eyes to some of the requirements that lower income families may require. Some of the projects included women's shelters, post pregnancy care homes, etc. All of which carry more social implication than a typical condo.

Supervisor Agrees.

5. Examples of my ability to work effectively as part of a team, during this period, include:

I worked with our office to complete the Civil design where I functioned as a designer, technical reviewer and performed overall project/product quality. On multiple projects I worked as part of a larger design team, coordinating with Architectural, Mechanical Consultants, Structural Consultants and Electrical Consultants as well as the developer and governing bodies.

Supervisor Agrees: Brett frequently works with other engineering disciplines as part of a consultant team.

6. Examples of my ability to assume responsibility include:

If my name is on a design or report I take responsibility for it's contents. I have had to discuss detailed work items with the City and work through projects that were not constructed to plan. On a couple of projects I quoted too low which resulted in a loss for the company. I acknowledged this and am trying to provide fair prices while remaining profitable. I assume responsibility when directing the work of others either in the office or field. When I act as a resident inspector on a work project I assume responsibility for the methods and documentation of the work performed.

Supervisor Agrees: Brett makes voluntary site visits to confirm that the design is suitable and that the

work is being completed as intended.

7. I have shown progress since the last report (where applicable) as follows:

I have shown progress in my organization, design and management. I feel I am starting to be more vocal when I see others continuing to work in what I would view as error.

Supervisor Agrees: Brett is taking on more responsibility for his work. He is developing his personal skills as it relates to interaction with co-workers where the goal is to produce a more productive team whilst maintaining a good working environment.

8. I feel myself to be lacking in exposure to, or requiring improvement in, the following areas:

I still need to improve on my team skills. I tend to be more independent which is sometimes useful but I do acknowledge I may do this too much. I would like exposure to larger projects I as I feel I have been confined to small to medium sized projects. I do have a couple on the go that show potential to evolve into more substantial designs.

I would like more field exposure to projects under construction, specifically on the inspection of underground works in the City of Winnipeg.

Supervisor Agrees: The company looks to participate in larger projects in the future and would offer Brett the opportunity to expand his technical skill set.

9. I would like to provide the following additional, relevant information:

In September I had more experience with testing and inspection.

Supervisor: Kyle Shymko P.Eng. (#24532) (First Registered: Jul 25, 2012)

I make the following evaluation and recommendation regarding the progress report for this MIT:

Brett is progressing well towards achieving his P. Eng. status. His eagerness to learn both the technical and managerial side of the profession combined with his attention to detail are certainly welcome at the firm.

In my opinion, during this reporting period, (Mar 1, 2015 - Aug 31, 2015) (6 months), Brett has completed an equivalent of 6 months full time engineering work experience.

Please show my comments to the MIT
