

Special Note:

In April 2013, the CM Faculty met to discuss ways to improve assessing the program outcomes. The result of this meeting was a revised outcomes assessment plan that provides updated methods to assess program goals and outcomes. In addition, the CM Program anticipates moving to a streamlined method for outcomes assessment which will assess all outcomes on an annual basis. These methods will be reflected in updates to the assessment plan and will be implemented starting next academic year (2013-2014).

Updates on Recommendations from last academic year

1. Effectively communication in graphical, oral, and written forms common in the construction industry. (Communication)
 - a. Changes/Revisions:
 - i. This area will continue to be integrated throughout the curriculum in CM and GE courses.
 - ii. The new curriculum now requires students to now take BA 105W (Business Writing).
 - b. UPDATE: More students are now taking BA 105W as part of the updated curriculum. The first cohort of students in this new curriculum will graduate next academic year. The impact of the increase writing requirements will be assessed at that time.**
2. Lead diverse teams in the completion of the design and construction of a project. (Leadership)
 - a. Changes/Revisions:
 - i. Leadership is being integrated throughout the revised curriculum. Additionally, this is the second year of a pilot leadership initiative within the program. These aspects will be improved from normal feedback, but no major changes will occur next year.
 - ii. The leadership initiative will continue to grow through next year. Improvements will be made according to the feedback from the previous two pilot years.
 - b. UPDATE: The leadership program was once again strong this year. Although it was a smaller group, it had a major impact on the program as a whole. The leadership program will expand once additional funding is secured.**
3. Work closely with other team members that are internal and external to the construction project team. (Teamwork & Team Relations)
 - a. Changes/Revisions:
 - i. Team assignments continue to be a large part of the CM program. Especially in the upper division courses. This will continue to be the case because of the perceived importance of this outcome. No changes or updates to this approach for next year.
 - b. UPDATE: No updates this year. The first cohort of students in this new curriculum will graduate next academic year. The impact of the increase teamwork requirements will be assessed at that time.**

4. Solve diverse problems in the design and construction of the project. (Problem Solving & Critical Thinking)
 - a. Changes/Revisions:
 - i. The new curriculum incorporates additional math, science, and engineering design courses (statics and strengths of materials) are anticipated to greatly improve these areas.
 - ii. The problem-solving format and grading schema used in CM 162 and CM 164 this year seemed to be highly successful. This format will continue through next year.
 - b. **UPDATE: The problem-solving format in CM 162 and CM 164 were continued this year with excellent results. More students engaged with the problem solving nature of the course. The failure rate decreased by 10% in each course. Additionally, a number of students mentioned the importance of problem solving in their senior exit surveys.**

Additional Program Items:

- Construction modeling and visualization is a significant weakness of students in the program. Specifically, students struggle with plan reading and 3D visualization. This has been addressed with the addition of BIM in the CM 4 course. This course began last semester and will continue to be improved upon next year. The course will continue to strengthen both plan reading and 3D visualization by adding more in class activities with actual construction documents and BIM platforms (Autodesk Revit).
 - **UPDATE: The CM Program attempted to offer a BIM course in Spring 2013, but was unable due to unforeseen issues. However, the program was successful in hiring a new faculty member with a research and teaching focus on BIM. Dr. Wei Wu will start teaching the CM 4 course and the CM 132 (BIM) courses next fall.**
- The program lacks adequate lab facilities for ‘hands-on’ experiences and updated computer systems and programs. These need to be addressed as soon as possible. It should be noted that the computer assets are now shared with the college. New computers are being purchased and will be installed over the summer. Additionally, funding has been made available to build a new “CM Outdoor Lab” which is currently in design.
 - **UPDATE: The “CM Outdoor Lab” is in the final design phase. The program hopes to have it constructed in the summer and ready for use by the fall.**
- Many students also identified the need to have more field trips in courses. The program is working with IAB members to make site visits more available. The only issue is the increase in class sizes. Large groups (more than 15-20 students) become a safety hazard on most construction sites.
 - **UPDATE: The CM student organizations (Students in Construction & Sigma Lambda Chi) were able to coordinate numerous site visits this year. These opportunities were utilized by various CM classes to engage students in field visits to projects.**

1. What Learning Outcomes did you assess?

The CM Program is in the third year of implementing an updated academic assessment plan. This update included significant revisions in the program mission and program outcomes. This update also aligns with the newly revised curriculum plan, which was approved in May 2011. As described in the updated assessment plan, four program outcomes will be directly assessed each year. The following outcomes were assessed this academic year:

- 5. Apply the principles of business and organizational management to successfully lead a construction enterprise. (Business Management)**
- 6. Efficiently plan, estimate, and prepare bids for construction projects. (Procurement & Pre-Construction Planning)**
- 7. Manage and control the schedule, cost, quality, safety, and sustainability for the project. (Project Administration & Controls)**
- 8. Demonstrate an understanding of the materials, means, and methods for various projects and sectors including buildings, utilities, infrastructure, and industrial construction. (Construction Knowledge)**

2. What instruments did you use to assess them?

Direct measures:

1. Senior Capstone Project (Annual)
2. Course Assessments (Every Semester)
3. American Institute of Constructors Level 1 Exam (Biannual)

Indirect measures:

1. Alumni Survey (Every Other Year – Even Academic Years)
2. Student Exit Surveys & Interviews (Annual)
3. Student Internship Evaluations (Annual)
4. Associated Schools of Construction Student Competition (Annual)

Additional measures not listed in SOAP:

1. Industry Advisory Board (IAB)/Student Forum
2. *IAB Curriculum Subcommittee [NEW] – Several members of the IAB along with one faculty member reviewed all courses and provided feedback on the content as compared to the initial requirements listed during the program re-design effort (which took place in summer 2010). This subcommittee provided invaluable feedback on the courses.*

3. *Course Kaizen [NEW] – In the Fall semester, the CM Faculty decided to start to review each course in detail. This effort was focused on continuously improving the program, the course, and the faculty member. Faculty, staff, and industry members were all invited to participate in these sessions. Since that point in time, the program has conducted four (4) of these 'kaizen' sessions. The program plans on reviewing 6-8 courses next academic year.*

3. What did you discover from the findings?

Findings:

Direct measures:

1) Senior Capstone Projects – The senior projects in the Spring 2013 offering of focused on two distinct programs. The first was the interdisciplinary project work in the Northern California Community Loan Fund (NCCLF) program. The other was the design, and some times construction, of service learning projects. The NCCLF projects were undertaken with students from the Real Estate (RE) Program out of the Craig School of Business. CM students conducted the service learning projects. Here are some notes from these projects:

- Once again, all teams either presented to a team of industry members (NCCLF) and/or created a poster for the LCOE Senior Projects Day. This provided a means for gaining valuable feedback from industry members.
- Again, the overall presentations for the NCCLF were very impressive. And once again, the industry members were very impressed with the feedback from the students.

2) Course Assessments were conducted in the following courses to address program outcomes:

CM 170 – Business Management (PO 5)

This course is a senior level course that builds upon the basic business management concepts taught in the junior level. The course focuses on introducing students to business management from the perspective of a construction organization. The placing of two questions in first exam assessed this program outcome. Students were asked to identify the best business structure for a given type of construction business and then to list ten key steps to starting their business. *(The standard for passing is 70%.)* Here is a summary of the results of the questions:

Exam 1					
Total	1	2	3	4	B
[75]	[20]	[12]	[18]	[25]	[10]
70	15	7	18	22	8
81	18	12	18	25	8

78	18	9	18	25	8
76	15	10	18	25	8
80	18	11	18	25	8
74	18	5	18	25	8
81	18	12	18	25	8
75	18	9	18	25	5
76	18	7	18	25	8
75	15	9	18	25	8
23	5	8	10	0	0
66	12	7	12	25	10
64	5	8	18	25	8
76	15	10	18	25	8
63	5	5	18	25	10
67	5	11	18	25	8
	13.6			23.3	
	68%			93%	

CM 116 – Project Planning (PO 6)

The primary focus of this course is to teach students how to appropriately plan a project. They are required to develop a project plan and schedule based upon a given scope of work. This is evaluated using a term project that they are required to complete. This term project is assessed using a standard rubric. (*The program standard is 2.8 out of 4.*) Here are the results of the rubric:

Frequency Distribution

Pull Planning Exercise Memo

Criteria		Fail	Satisfactory	Good	Excellent	Outstanding	Number Evaluation	Average
Format	Points	2.34	3.19	3.61	4.04	4.25		
		0%	8%	15%	50%	27%	26	3.96
Organization	Points	2.34	3.19	3.61	4.04	4.25		
		4%	4%	12%	54%	27%	26	3.95
Grammar	Points	2.34	3.19	3.61	4.04	4.25		
		0%	8%	58%	27%	8%	26	3.74
Understanding of Trade	Points	2.20	3.00	3.40	3.80	4.00		
		4%	8%	12%	62%	15%	26	3.66
Team Collaboration	Points	2.34	3.19	3.61	4.04	4.25		
		0%	4%	12%	46%	38%	26	4.04
Benefits of Pull Planning	Points	2.20	3.00	3.40	3.80	4.00		
		0%	4%	8%	42%	46%	26	3.83

CM 170 – Project Administration & Control (PO 7)

This is new senior level course that focuses on teaching students various aspects of project administration and control. This outcome is assessed using embedded questions in the final exam. The students are given a project and then asked to identify the major methods and tools to administer and control the project. *(The standard for passing is 70%.)* Here are the results from the final exam:

Manual Score 1 [35]
30.625
88%
35
35
35
25
35
30
35
25
35
30
30
20
25
25
35
35

CM 116 – Construction Knowledge (PO8)

One of the assignments in this class is to develop a scope of work for a given trade. This provides students an opportunity to research a trade and demonstrate their knowledge gained from this research. A rubric is used to assess this assignment. *(The program standard is 2.8 out of 4.)* Here are the results from this assignment:

Frequency Distribution

Scope of Work Memo

Criteria		Fail	Satisfactory	Good	Excellent	Outstanding	Number Evaluation	Average
QC Identified	Points	2.20	3.00	3.40	3.80	4.00	22	3.53
		5%	5%	45%	36%	9%		
Appropriate Materials	Points	2.34	3.19	3.61	4.04	4.25	22	3.82
		5%	5%	36%	32%	23%		
Activity Duration(s)	Points	2.20	3.00	3.40	3.80	4.00	22	3.34
		14%	0%	64%	18%	5%		

3) AIC Level I Exam – Only one (1) student took the Associate Constructor Exam this year. This student did not pass the exam. It should be noted that this student is a graduate of the program and failed the exam last year.

Summary of AC Exam Data

Year	Exams Taken	Exams Passed	% Passed	1	2	3	4	5	6	7	8	9	10
AY12-13	1	0	0%	Yellow	Yellow	Red	Red	Yellow	Red	Red	Red	Red	Red
AY11-12	2	0	0%	Green	Red	Red	Red	Red	Red	Red	Red	Red	Yellow
AY10-11	8	6	75%	Green	Red	Green	Red	Green	Green	Green	Green	Green	Green

Notes:
Areas that exceed minimum passing score and national average
Areas that need some improvement (above average, but not passing)
Areas that need significant improvement (below average and not passing)

	Categories
1	Comm. Skills
2	Eng. Concepts
3	Mgt Concepts
4	Mtls, Methods, Modeling & Viz
5	Bidding & Estimating
6	Budgeting, Costs, Control
7	Planning, Sched, Control
8	Cnstr. Safety
9	Constr. Geomatics
10	Project Admin.

The AC exam has lost momentum over the past two years. The first year had limited participation (8 students). This participation was primarily because it was offered as an alternative to the final exam for the previous senior project course (CM 144).

The CM Program needs to re-evaluate the value of this exam for next year.

Indirect measures:

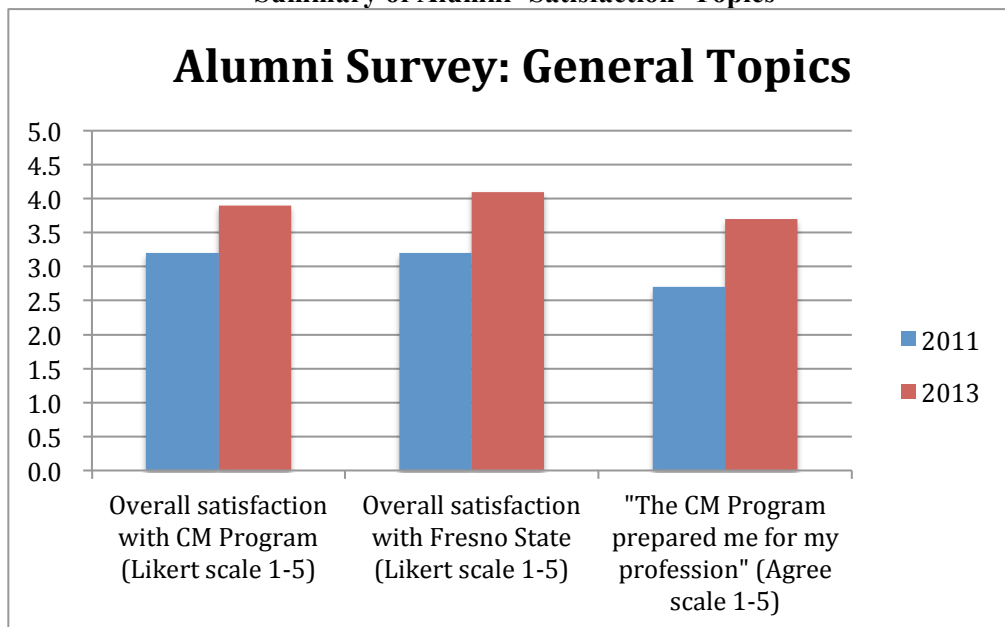
1) Alumni Survey – The alumni survey was sent to over 150 alumni that had graduated within the last five years. Over forty alumni completed the survey for a 27% response rate. This is an improvement from the previous cycle (2011).

Summary of Alumni Survey Data

Other Data	2011	2013	Change
Approximate total contacted	121	162	41
Responses (n)	18	43	25
<i>Response Rate</i>	15%	27%	12%
Percentage working in the construction industry	89%	91%	2%
Average salary	\$65,417	\$61,570	\$(3,847)
Overall satisfaction with CM Program (Likert scale 1-5)	3.2	3.9	0.7
Overall satisfaction with Fresno State (Likert scale 1-5)	3.2	4.1	0.9
"The CM Program prepared me for my profession" (Agree scale 1-5)	2.7	3.7	1.0

This year’s responses also provided a significant improvement in all of the ‘satisfaction’ questions. This increase may be attributed to the increase number of respondents from the previous cycle. It could also be attributed to the positive changes in the CM Program over the past four years.

Summary of Alumni ‘Satisfaction’ Topics



The final area of comparison was the average responses of the alumni's perceptions of the 'Importance' and their 'Proficiency' of the Program Outcomes. Comparison between the two cycles showed a general improvement in nearly every category.

It should be noted that the lowest outcome in perceived 'Importance' and 'Proficiency' is Sustainability. The CM Program has worked hard over the past four years to integrate this important topic throughout the curriculum. It has yet to be reflected in this survey. This is an area that needs to be continually tracked.

Summary of Alumni Perceptions of Program Outcomes

LO	Learning Objective	2011			2013		
		Importance	Proficiency	Diff	Importance	Proficiency	Diff
1	Effective Communication	4.67	4.61	(0.06)	4.68	4.62	(0.05)
2	Leadership	4.61	4.28	(0.33)	4.15	4.19	0.04
3	Teamwork & Team Relations	4.44	4.50	0.06	4.65	4.62	(0.03)
4	Problem Solving & Critical Thinking	4.67	4.50	(0.17)	4.75	4.62	(0.13)
5	Business Management	3.94	3.72	(0.22)	3.98	4.05	0.08
6	Procurement & Pre-Con Activities	4.06	3.89	(0.17)	4.33	4.03	(0.30)
7	Project Administration & Controls	4.22	4.00	(0.22)	4.28	4.03	(0.25)
8	Construction Knowledge	4.33	4.06	(0.28)	4.23	4.14	(0.09)
9	Legal & Ethical Responsibilities	4.22	3.94	(0.28)	4.25	4.19	(0.06)
10	Integrated Project Practices	3.89	4.06	0.17	4.03	4.11	0.08
11	Sustainability	3.28	3.44	0.17	3.33	3.73	0.40
12	Construction Safety	4.11	4.17	0.06	4.40	4.19	(0.21)

2) Student Internship Evaluations – The internship program is currently being revised this year.

//Provide data and analysis//

3) Student Exit Interviews – The response rate improved this year. This could be attributed to a couple of factors. First, the survey was moved online to make it easier for students to complete at their own pace. Second, students were give the survey a month before graduation.

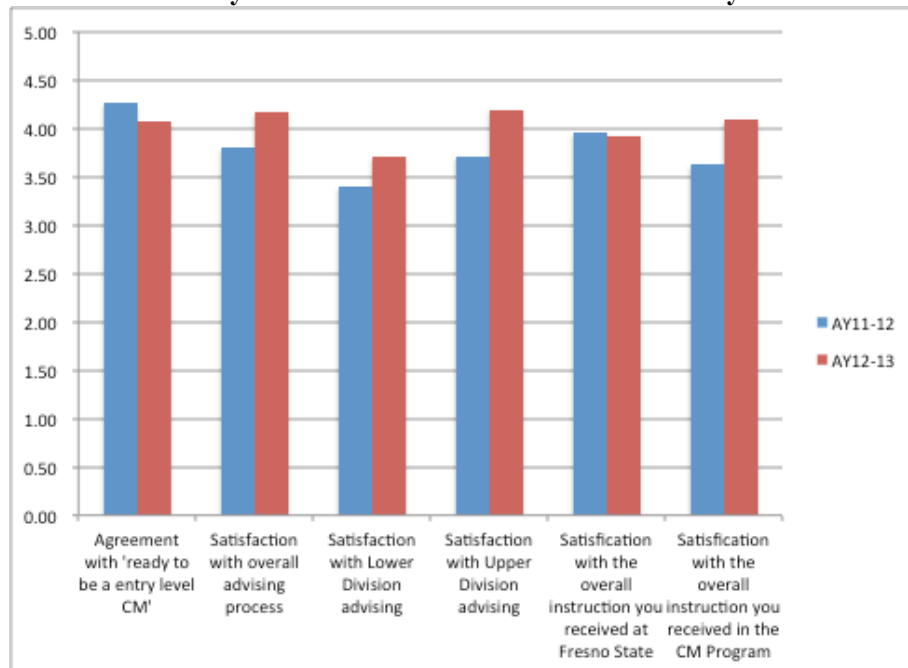
The number of student given a job offer in construction stayed approximately the same, but the average salary increased slightly. Additionally, more students took advantage of internships in this graduation class (more than doubling the percentage).

Summary of Exit Survey Data

Other Data	AY11-12	AY12-13
Total number of graduates	49	46
Responses (n)	31	40
Response Rate	63%	87%
Number of students interested in graduate studies	7	20
Percentage of students interested in graduate studies	23%	50%
Number of students offered construction employment	19	24
Percentage of students offered construction employment	61%	60%
Average number of construction job offers	-	1.9
Average Salary for construction job offers	\$54,602	\$56,375
Average hours worked while in school	-	20.6
Number of students that completed an internship	11	26
Percentage that completed an internship	35%	65%

There was overall improvement in most of the ‘satisfaction’ levels for the graduates. The only exception was a slight dip in the “Agreement with ‘ready to be an entry level CM’” question. However, the dip was minor in relation to the overall score. One potential area of improvement is advising, especially lower division advising.

Summary of Satisfaction Levels from Exit Survey Data



Employment data remained consistent with last year, with the exception of an increase in the average salary and a decrease in the “Unable to Find Employment” number. Note that two new categories were added this year including “Average Number of Construction Offers” and an “Other” category for employment status.

Summary of Employment Data

<i>Academic Year</i>	A09-10	AY10-11	AY11-12	AY12-13
Graduates	39	54	49	46
Count	33	41	31	40
<i>Response Rate</i>	85%	76%	63%	87%
Offered Job in Construction	14	16	19	24
	42%	39%	61%	60%
Average No. Construction Offers	-	-	-	1.9
Interned with Company	7	12	11	26
	21%	29%	35%	65%
Employed (Other) or Cont. Ed.	13	16	7	6
	39%	39%	23%	15%
Other	-	-	-	6
	-	-	-	15%
Employed, Offered, or Other	27	32	26	36
	82%	78%	84%	90%
Unable to Find Employment	6	9	5	4
	18%	22%	16%	10%
Average Salary	\$42,233	\$44,083	\$54,602	\$56,375

4) Associated Schools of Construction Student Competition – Forty (40) students competed in five separate student competitions this year. Here is a brief summary of each competition:

- *Commercial Construction* – Teams were tasked with creating a construction bid and plan for a large building in California. This team took a step back from the previous years. They struggled with the complexity of the project and some of the simple CM skills (estimating, scheduling, etc.). All of the team members were new and had little to no actual work experience.
- *Design/Build Solution* – The team was tasked with designing and creating a construction plan for a science building at another CSU campus. This team performed much better than the previous years. However, the lack of good BIM and design skills still put this team behind the other teams in the competition.

- *Heavy Civil Construction* – The problem in this competition was to create a bid and construction plan for a replacement bridge in the state of Washington. For the first time since the inception of the competition, ***the Fresno State Team finished 1st in this regional problem.*** This is significant milestone for the students and the program.
- *Leadership in Energy & Environment Design (LEED)* – This team was tasked with calculating various design and construction “credits” for the LEED rating system. ***For the second year in a row, the team finished in 2nd place in this national problem statement.*** (This team beat out teams from Cal Poly, Sac. State, Chico State, Virginia Tech, and other national schools.)
- *Preconstruction* – This competition requires students to perform preconstruction services for a large project. It was the first year of this problem statement for Fresno State. Overall the students did well in the presentation and some of the technical areas. The most significant weakness was in the area of technical knowledge specific to the problem.

Additional measures not listed in SOAP:

Industry Advisory Board/Student Forum – The Industry Advisory Board conducted a ‘Student Town Hall’ meeting in November. The IAB members met with over 20 students and asked them questions about the program. There were several recurring themes from last year. One example is that students stated that they would like more field trip opportunities and site visits so that they could readily see the construction field. Additionally, students reiterated that they see positive changes in the program. No other significant comments were noted from this year.

Industry Advisory Board Curriculum Committee – Here are some general comments and recommendations:

- It is recommended that the Syllabi be uniformly formatted across the program. Syllabi’s for each course currently vary, not all contain Course description, learning outcomes, Course goals.
- Outdated Syllabi should be reviewed. Some current versions were produced by staff that are no longer present in the program.
- Construction Graphics, Design theory, Critical Thinking were added to the review criteria to ensure that ACCE requirements were covered.
- Some classes allow for late work in the syllabus. In the real world missing deadlines is not acceptable and often will result in the loss of a project (bid deadlines) or harsh penalties (Liquidated damages). It would be preferred to make deadlines on assignments for all classes uniform, with steep penalties for being late.
- There was discussion about the different electives classes and whether or not class clusters should be required in total. The concern was if students would miss important portions of what was taught if not all the classes were required in an elective tract. This is based on the elective class curriculum being progressive.
- Unclear if Site Layout and Utilization of a construction site should fit into CM-144. It is recommended that these topics are covered in a core class at some point.

- Storm Water Pollution Prevention Plans need to be picked up in a class as some point, also unclear if this is a fit for CM-144. However it is recommended that this be in a core class.
- It is recommended that all Syllabus be revised to include the 5 main learning outcomes of each class. Learning out comes should be clear and concise as it relates to the CM grad.

Course Kaizen – Below are some general comments and recommendations:

- CM 110 Kaizen (12/10/12):
 - Incorporate virtual mock ups into CM 7S (via SketchUp) if possible
 - Integrate COINS game into CM 170 to teach construction business management
 - Create an online ‘pre-test’ for plan reading at beginning of CM 110
- CM 116 Kaizen (1/25/13):
 - Include book “The Goal” as reading assignment throughout semester
 - Provide fixed resources (labor, time, etc) and have students produce schedules
 - Include peer review in group grading
 - Find a way to introduce Excel earlier than CM 110
 - Use teleconferences to bring speakers to class
- CM 122 Kaizen (2/11/13):
 - Add partnering specs to discussions on ADR
 - Add more case studies to course (specifically in reference to ethics)
 - Failure case studies need to be reviewed for CM 7 and CM 181 inclusion
 - Look for ways to integrate business law/ethics earlier in curriculum
- CM 180 Kaizen (4/25/13):
 - Look into use of IT160 for next year
 - Identify funding sources for project
 - Establish ‘call for work’ process to keep projects flowing
 - Keep other disciplines engaged

4. What changes did you make as a result of these findings?

The newly revised curriculum started this academic year and will be officially in the General Catalog in the 2012-2013 Academic Year. However, the integration of the curriculum will take place of the next two years to allow for students in the old curriculum to see minimal interruptions in their degree path. As was stated the previous two years, it is anticipated that many of the issues and concerns noted in this year’s activities will continue to be addressed with these curriculum changes.

The following general areas of concern have been identified from the assessment activities will be addressed in the following ways:

5. Apply the principles of business and organizational management to successfully lead a construction enterprise. (Business Management)
 - a. Discussion: This topical content was covered outside of the CM courses prior to the curriculum revision. The content is now covered in CM 170 and CM 180A/B. The initial inclusion in CM 170 was very basic and students achieved the minimum level of knowledge in the class.
 - b. Updates/Changes/Revisions:
 - i. CM 180A/B will now include ‘establishing’ a construction enterprise as part of their capstone experience.
6. Efficiently plan, estimate, and prepare bids for construction projects. (Procurement & Pre-Construction Planning)
 - a. Discussion: Students continue to do well in this area. The focus on estimating, planning, and scheduling is a core topic in the curriculum.
 - b. Updates/Changes/Revisions:
 - i. Minor changes will be made to CM 110 and CM 116 as identified in the course kaizen sessions. They will also be slightly modified to improve the integration of other topics in the curriculum.
 - ii. Since CM 144 is becoming an elective, the SWPPP and Site Planning elements need to be moved to a core course. It was determined that CM 116 is the appropriate course for this content.
7. Manage and control the schedule, cost, quality, safety, and sustainability for the project. (Project Administration & Controls)
 - a. Discussion: These topics are newly integrated into the curriculum via the CM 170 course. Initial assessment showed that students achieved the minimum standards for this content.
 - b. Updates/Changes/Revisions:
 - i. In addition to CM 170, this content will be utilized in CM 180B in the future. The faculty will have to collaborate and discuss methods to adequately assess this content in that course.
8. Demonstrate an understanding of the materials, means, and methods for various projects and sectors including buildings, utilities, infrastructure, and industrial construction. (Construction Knowledge)
 - a. Discussion: This is one of the most important outcomes in the curriculum. The focus is less on how much students know about all types of construction, but rather how easily they can learn about these topics in the future. Assessment of this outcome in CM 116 showed that this program standard was met.
 - b. Updates/Changes/Revisions:
 - i. Integrating ‘virtual mock ups’ into lower division courses is an important idea. This will be attempted in the CM 4 and CM 7 courses in future semesters.
 - ii. The ‘scope of work’ memo that assesses this outcome will be improved upon in CM 116 to ensure adequate coverage of this topic.

Additional Program Assessment Items:

- The CM Program reviewed all program assessment methods, measures, and standards during a half-day retreat in early April 2013. The following summarizes the outcomes of this meeting:
 - The CM Program Assessment Plan will now include 3 levels of assessment:
 - Level 1 – Program Goals
 - Level 2 – Program Learning Outcomes
 - Level 3 – Course Learning Outcomes
 - Assessment Methods, Metrics, and Standards were discussed for all levels. These were updated for Levels 2 and 3. These will be updated and developed for Level 1 at a retreat prior to the next academic year. (See Attachment 1)
 - The Curriculum Assessment Map was updated according to feedback from faculty course kaizens, the IAB curriculum committee, and discussions in the retreat. (See Attachment 2)
 - A Program Outcomes assessment matrix was established for each program outcome that describes the methods used to assess the outcome, the standard for measurement, and the results from the assessments. (See Attachment 3)
 - Program Outcomes will be assessed on an annual basis if at all possible. A streamlined process for gathering and assessing data needs to be determined to make this feasible.
- The Alumni Survey Results showed that the “Sustainability” outcome is the lowest perceived “Importance” and “Proficiency”. This is an area that needs to be further evaluated in the next cycle to see if this is a reflection of the new focus in the curriculum or if something is missing within the content delivery.
- The Exit Survey Results provided one area of potential improvement – lower division advising. The CM Faculty agreed to meet at the beginning of the fall semester to evaluate how advising could be improved.