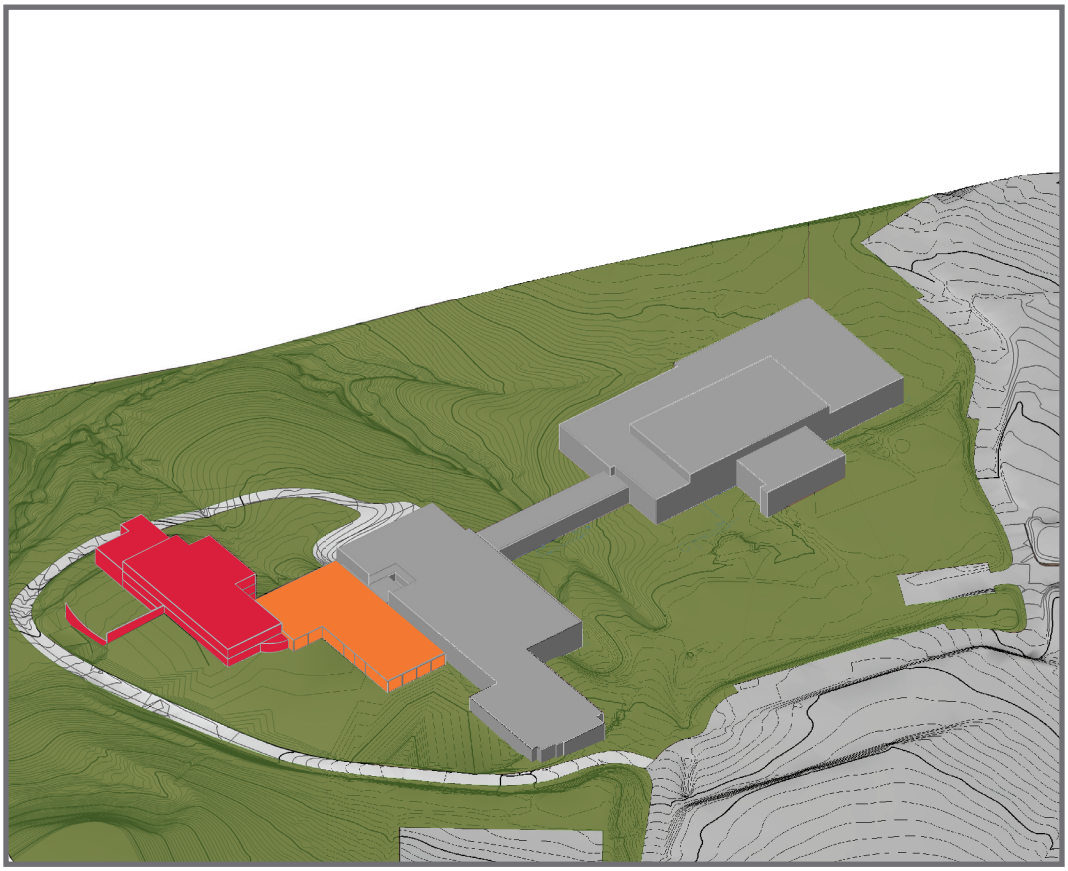
Construction Technology/ISOD Program Plan
Red Rocks Community College

25 June 2007



AR 7

Construction Technology/ISOD Program Plan
Red Rocks Community College

May 2007

Prepared by
Red Rocks Community College
AR7 Architects, PC

Participants:

Red Rocks Community College

Cliff Richardson	President
Joan Smith	Executive Director
Peggy Morgan	Vice President
Cathy Rock	Construction Technology Program Coordinator
Chuck Beck	ISOD Program Coordinator
Jody Glennon	Director of Facilities
Rand Richards	Fine Woodworking
Renie DelPonte	Dean of Instructional Services

Industry Employers

Ed Gonzales	Xcel Energy
Jim Willard	Xcel Energy
Laura Naugle	Xcel Energy
Hank Ward	Molson Coors
Ken Losasso	Suncor Energy (USA)
Tracy Boyd	Shell Exploration & Production Company

Jefferson County School District

Lane Warner	Alameda High School

Consultants

Steve Schonberger	AR7 Architects
Gary Desmond	AR7 Architects
Richard Epstein	AR7 Architects
John Bengston	Paulien & Associates
Kate Herbolsheimer	Paulien & Associates

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1.0 Preface and Summary

1.1 Executive Summary

"To be competitive in an age of outsourcing, American workers need to excel as creative problem solvers, understand business culture, demonstrate excellent communication skills, and succeed in collaborative environments."[1]

Preparing today's workforce with the highly technical skills required by the 21st century industries in Advanced Manufacturing, Construction Technology, and Energy Production requires much more than the traditional classroom. Learners must have access to scenario-based educational environments that simulate and in many cases replicate the workplace. When students have access to these environments they are gaining applied knowledge while engaged in problem solving tasks "set in realistic professional contexts that require critical analysis, synthesis, and production of professional deliverables and generation of professional recommendations."[2]

Red Rocks Community College (College) requests funds for renovation of and an addition to the existing Construction Trades Educational Facility on the campus. The renovation/addition will provide 112,000 gsf to house the Industrial Science and Operations Program and Construction Technology Cluster. This project is the first priority in the College's Institutional Master Plan due to the existing over-crowded conditions and unsafe facility environment. In addition to addressing space needs, life-safety issues, and numerous code violations, this project will solve several other logistic problems currently experienced by the College in the areas of maintenance, shipping and receiving, mailroom operations and student circulation needs.

Located at the extreme West end of the campus, the existing structure currently houses Construction Technology, Physical Plant, Shipping/Receiving, and the Mailroom. It is a one-story building (high bay) with a small mezzanine space that no longer meets building code requirements. Its floor level is approximately congruent with level 3 of the overall campus-building complex. Other "temporary" mezzanine space has been constructed within many of the existing high bay laboratories and shops creating significant code violations and life-safety issues. This project proposes to eliminate these mezzanine spaces.

The Master Plan proposes extending the Main Circulation Spine to and through the existing Construction Technology Building to a defined entrance at the west end of the campus. This project provides for the future implementation of this connection.

The significance of the Red Rocks Community College (RRCC) Construction Technology Cluster (CTC) and Industrial Science and Operations Department (ISOD) to the State of Colorado is extraordinary. These programs are preparing workers for two of the fastest growing industries in Colorado; Construction Trades and Advanced Manufacturing. Advanced manufacturing refers to the process industries that include gas and oil production and refining, water quality and waste water treatment, power generation, pharmaceutical and food and beverage production. The CTC is entering its 36th year of operation and is the largest provider of skilled workers to Colorado's construction industry workforce with enrollment head count exceeding over 2,000 per year. The College is the only post-secondary institution in the state of Colorado to offer complete Construction Technology degrees and certificates in eleven construction emphases.

Between 2000 and 2006, annual headcount enrollment in the Construction Technology Cluster has fluctuated. Enrollment has been impacted negatively by the dissolving of the partnership with the Construction Industry Training Council as a direct result of the inadequacy of space to accommodate changing technologies, and positively by the significant growth of the Fine Woodworking Program (FIW). The FIW has grown to the second largest college furniture building program in the country. However, because of the rapid growth FIW is now facing difficult decisions as the lack of space is beginning to negatively impact the quality of the program's laboratories and necessary storage facilities.

The Industrial Science and Operations Department (ISOD) began offering the AAS degree in process technology in the fall of 2005. Partnerships with high schools have resulted in successful recruitment as students earn college credits that transfer upon high school graduation and

[1]Busch, Doug. 2004. Vice President, Intel Corporation.
[2]Ayers, C. Ostrander, J. 2005, December. Scenario-based learning for a more relevant student experience. League for Innovation. www.league.org.

college matriculation into the ISOD program. The ISOD will begin to offer degrees in Industrial Maintenance Technology-Mechanical and Industrial Maintenance-Electrical in the fall of 2007. To accommodate the growth already experienced in the ISOD interim laboratory and classroom space has been renovated at the Arvada Campus of 5,900 square feet which will add 2 labs, 2 classrooms, and a computer simulation control room.

The facility addition of 82,000 gross square feet and the existing facility renovation of 30,000, gross square feet, will enable the College to greatly expand the CTC and ISOD to better meet industry demands. A total of 79,000 assignable square feet will be provided: 11,000 asf of classrooms, 8,000 asf of office space, and 60,000 asf of laboratories and shops. This will increase student success as measured by our industry partners in degree and certificate completion, job placement, and continuing education to help incumbent workers remain current with 21st century technologies. The existing Construction Technology building structure will be retained, with the interior completely renovated. A new three-story addition will be located northwest of the existing building. The existing building will accommodate the high-bay requirements of Physical Plant and Industrial Maintenance. New construction will provide appropriate laboratory, shop, and classroom space for Construction technology and ISOD.

The total projected cost for this renovation/addition is $40,000,000.

1.2 Program Plan Process

The college community of faculty, support staff, administrators, industry employers, and members of the Jefferson County School District were involved in developing this Program Plan. AR7 Architects was commissioned to facilitate and help develop the Red Rocks Community College Facility Master Plan. The College believes the process should not only be in compliance with the new Colorado Commission on Higher Education policies in facility planning, but should also play a vital role in the new planning process and environmental development as directed by the new college president. The involvement of the numerous participants mentioned above resulted in a lengthier than normal process, but the results and certainty of future direction made the time spent worthwhile.

The top priority, which was evident throughout the process, is the critical requirement for an addition to and renovation of the existing Construction Technology building. This program plan was made possible through a tremendous amount of personal investment from the entire faculty in the construction trades and industrial science and operations programs. The employer partners relying on these programs for the recruitment and preparation of a highly skilled workforce have provided input concerning future workforce needs and the technological industrial skill standards that the graduates of these programs must demonstrate to work in the construction and process technology industries. The continuing involvement of the staff at AR7 helped facilitate the transition from the priorities of the Master Plan to the needs of this specific program plan.

The employer partners of the Industrial Science and Operations program completed a detailed analysis of the classroom laboratory requirements. The requirements attached to this document identify workplace processes. The employers participating in the analysis included representatives from food and beverage production, oil and gas exploration, production and refining, and water and waste water treatment. This analysis was used as supporting documentation in developing the space design.

The leadership of the college has been continually involved in the final review of the plan and its feasibility.

2.0 Program Information

2.1 Description of Program

Construction Technology Cluster CTC

The Construction Technology Cluster (CTC) includes training in the following curriculums:

- Air-Conditioning/Refrigeration
- Heating
- Carpentry
- Construction Management
- Electrical
- Fire Protection Electrical Alarm Systems
- Facility Maintenance
- Fine Woodworking
- Plumbing
- Energy Technology ENY

Red Rocks Community College is the only post-secondary institution in the state to offer a complete Construction Technology Cluster. It is well respected in the industry. The unique Associate of Applied Science (AAS) degree provides students the flexibility to select multiple areas of emphasis.

In the last year, RRCC's Construction Technology Program has partnered with Jefferson County and Denver Public Schools to develop science curriculum to introduce students to Renewable Energy Technologies and how these technologies will impact the construction industry. The ENY 101 Introduction to Renewable Energy is a project-based look at energy conservation, renewable methods of generating electricity including solar, wind, biomass, hydrogen (fuel cells) and geothermal. The ENY 101 is a transferable course which allows high school students to earn college credit for successful completion.

The CTC is working with its industry Advisory Council to review and make adaptations to curriculums to prepare a workforce skilled in the emerging LEED (Leadership in Energy and Environmental Design) Green Building Rating System.™ LEED promotes a whole-building approach to sustainability by recognizing performance in five key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality.
Colorado's Governor Bill Ritter has made commitments to achieve an increase in the renewable energy sources powering our state from 10 percent to 20 percent and adding energy-efficiency requirements such as those specified by LEED to construction standards for state buildings.

Fine Woodworking FIW

Changes in program offerings producing rapidly growing enrollment has resulted in Red Rocks Community College's Fine Woodworking program becoming a national model attracting students from across the country. Courses offered as part of FIW include Workbench Building, Cabinetry, Guitar Building, Strip Canoe, Carving, Marquetry, Furniture making, Wood Turning, and Finishing. The FIW courses offer intensive hands-on learning designed to provide the skills necessary for all levels of woodworking. This program is equally suited to the hobbyist as well as the individual desiring to pursue a career in one of the many woodworking disciplines (Artisan, Patternmaker, Cabinetmaker, Trim Carpenter, Furniture maker, Shop/Bench Carpenter). The FIW program currently offers one degree and nine certificates. The growth from 180 students five years ago to more than 600 in the 06-07 school year, has put significant demands on already limited space. The potential of this program to continue to grow and produce highly skilled wood artisans and high end carpenters (one of the most highly sought employees in the construction industry) will require the space necessary to introduce the equipment and technologies of modern woodworking industries.

Industrial Science and Operations Department ISOD

In November of 2004, because of the reputation of Red Rocks Community College as a premier educational provider of technical workers, the employer partners of the Rocky Mountain Alliance for Process Technology (RAPT) asked the College to become the lead higher education institution in the development of the first Industrial Science and Operations program in Colorado for process industries. The College joined the industry representatives in developing curricula for degree and certificate programs for process operators and operator maintainers working in advanced manufacturing in process industries.

RRCC began offering the first process technology

AAS degree program in Colorado as part of the new Industrial Science and Operations Department (ISOD) in the fall of 2005. Seven students enrolled in the first term. Growth has been steady with a current 06-07enrollment of 40 students. The energy industry members of RAPT include employers from five states in the Rocky Mountain Region. The energy and advanced manufacturing employer partners of RAPT that are involved in RRCC's ISOD with headquarters and plant operations in the metro Denver area are Xcel Energy, Suncor USA, Coors Brewing Company, and Metro Wastewater Reclamation District. Additional partners that have made significant contributions to RRCC's ISOD include BP America, Shell Oil Exploration and Production, and Marathon Oil.

The industry partners have been instrumental in providing instructors, funding for scholarships and laboratory equipment, and ensuring the curriculum taught by the ISOD is aligned with industry standards. Hiring industry professionals as instructors fosters the teaching of real world operations that begins to reinforce hands on applications of math and science as students learn about the flow, level, temperature and pressure as raw products take on chemical and physical changes.

The ISOD is developing two additional degree programs for industrial maintenance. As a result of the rapid technological advancement of the manufacturing processes and equipment used by our employer partners, the need for highly skilled maintenance personnel is quickly surpassing the existing workforce pool in Colorado. The Associate of Applied Science Electrical and Mechanical degrees provide options for incumbent workers to gain secondary skills sets. The electro-mechanical degrees and certificates in addition to preparing new technicians as industrial electricians and mechanics will offer rapid secondary skill acquisition for crafts persons already trained as industrial electricians or maintenance mechanics seeking employment advancement as multi-craft personnel. The ISOD degree plans, Process Plant Technology and Industrial Maintenance Technology include degree and certificate options defined by job qualifications required by industry.

2.2 History of Program

Construction Technology Cluster CTC

The Construction Technology Cluster prepares students for career entry and advancement in Air Conditioning, Refrigeration, Heating, Carpentry, Construction Management and Supervision, Construction Technology, Facilities Maintenance, Electrical (residential, commercial and industrial) and Plumbing.

The enrollment fluctuations are a result of challenges the CTC has encountered in balancing

Construction Technology (CON, CAR, PLU, HVAC, FIW, EIC)	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000
Head Count Enrollment	1992	2078	2231	2344	2282
Annualized FTE	276.01	296.23	324.39	330.33	256.25
Completers	48	63	73	50	88

Construction Technology (CON, EIC, CAR, PLU, HVAC, FIW)	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007 *Census Not Final
Head Count Enrollment	2,144	2,124	2,600	2,433	2,564	*2,218
Annualized FTE	239.14	257.17	299.47	276.8	285.63	*258.74
Completers	87	113	83	70	55	TBA 05/07
Job Placement (Based on Self Reported Graduate Survey Respondents)	90.70%	96.77%	89.29%	100.00%	86.11%	TBA 3/08

the quality delivery of instruction with space limitations that required difficult decisions in effecting what courses can be offered. In fall 2005 a partnership with the Construction Industry Council dissolved due to the inability of the CTC to respond to the improvements required to keep pace with the experiential learning required by the CITC and their employer partners.

Fine Woodworking FIW

To accommodate the rapid enrollment growth, FIW has made revisions in course delivery to maximize space resources that has included the delivery of intensive weekend seminars. Over the past four years, the program has seen a dramatic shift in its clientele (students). No longer are the majority of the students interested only in the hobbyist side of woodworking. The beginning classes are seeing a change in intensity and focus. Scheduling adaptations have grouped beginning courses during the weekends to open more time for the more advanced and career focused students during the week. Furthermore, having classes on the weekend makes the program available to a wider range of students.

Fine Wood Working	2001	2002	2003	2004	2005	2006	2007 *Census Not Final
Enrollment	292	359	354	426	517	601	*630
AFTE	25.54	37.1	41.22	48.65	59.35	73.34	*74.32

While these innovative approaches have resulted in significant enrollment returns for the FIW program, modified scheduling is only a short-term solution to the growing challenges of space limitations that have begun to impact further program growth. The leveling of enrollment as displayed in the chart is as a direct result of reducing class size and class offerings due to space limitations.

Industrial Science and Operations Department ISOD

The Industrial Science and Operations Department has received grant awards from the Governor's Office of Workforce Development, the Colorado Community College System and the Colorado Energy Research Institute totaling more than $550,000 for fiscal years 2006 and 2007. An award of $400,000 has been received for fiscal year 2008 from the WIRED workforce development initiative through the Metro Denver Economic Development Council funded by the USDOL. These funds are being used to develop curriculum, prepare faculty and equip the lab space. Grants are an effective alternative revenue stream for non capital program start up and continuing development.

The rapid advancements in technology shown in the pictures below of process operators in the 1950s and today are compelling in demonstrating how complex these jobs have become. The ISOD uses a curriculum developed by industry from the Center for the Advancement of Process Technology and taught by experts working in our partner industries to prepare students for employment as process operators and maintenance technicians.

Through partnerships with Jefferson County Public Schools, the largest district in Colorado with an annual enrollment of 86,000 students, Red Rocks Community College has worked with high school science faculty to create an 11-14 grades pipeline for process technology. Efforts are currently underway to expand the science curriculum to schools in Adams County as well as high schools on the Western Slope. A new 2007-2008 grant award will compensate faculty teams that include the Denver Earth Science Project from the Colorado School of Mines and the Colorado Energy Science Center to integrate real world mathematics and science laboratory modules and create summer institutes to support faculty in improving the STEM outcomes of the high school students enrolled in the process technology science courses.

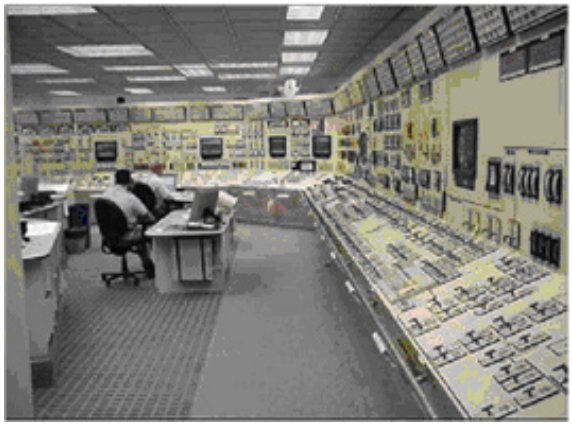
Industrial Science and Operations (PRO)	Fall 2005	Spring 2006	Fall 2006	2006-2007 *Census Not Final	Projected
Head Count Enrollment	2	34	38	47	
Annualized FTE	0.20	3.53	4.03	5.53	150

2.3 Program Needs and Trends

The National Science Foundation noted in the 2006-2007 ATE Centers Impact: Partners with Industry for a new American Workforce that

> technicians are the underappreciated heroes of the nation's economy. They have kept traditional industry humming….in the 21st century the stakes are even higher. The U.S Department of Labor estimates the nation needs five technicians for every new scientist or engineer employee to keep pace with competition in the global marketplace.

The greater challenge to America's competitiveness is not low-cost goods from low wage producers in developing countries according to the Manufacturing Institute's 2004 Keeping America Competitive report. As stated in the Competitive report, America's success in a global marketplace in the 21st century is hinged on the production of high quality goods made by high skilled workers. The potential exists that without a workforce pipeline of highly skilled technicians with postsecondary preparation, manufacturers may seek the technological talent that



is being strategically and purposefully prepared in places like the European Union, the Pacific Rim (including China) and South Asia, particularly India. The US Department of Labor reports that associate or higher degrees are required for 19 of the 30 occupations projected to grow most quickly by 2012. Projected employment growth between 2002 and 2012 for Electricians and Carpenters according to the U.S. Bureau of Labor Statistics exceeds 300,000 new jobs. A job projections summary through 2012 for careers in the Construction and process industries has been compiled using data from the Colorado Department of Labor and Employment, Labor Market Information. The summary is projecting more than 30 percent growth across these industries.

Construction Technology Cluster CTC

Construction is the second-largest industry in the nation, employing about 7 million workers. It contributes about five percent of all domestic U.S. economic activity and accounts for nearly ten percent of all businesses-mostly small, privately owned firms. The construction industry is predicted to add approximately 1 million new jobs between 2002 and 2012, an increase of fifteen percent. With total employment expected to reach 7.8 million by 2012, the construction industry is predicted to be among the economy's top ten largest sources of job growth according to the U.S. Bureau of Labor Statistics. Construction has a very large number of self-employed workers. Opportunities for workers to form their own firms are better in construction than in many other industries.

3

The American Institute of Architects issued a new policy directive in December 2005 with the ambitious goal of reducing new building use of fossil-fuels in the United States by fifty percent. The demand for renewable power products in a competitive marketplace is predicted to increase rapidly by the United States Department of Energy. "The progress of utility restructuring and proposed state and federal mandates/incentives for consumers and utilities to purchase green power could substantially strengthen the renewable power industry. This, in turn, may further decrease costs of renewable power and increase the number of jobs available in the renewable energy industry."[3]

Colorado's Governor Bill Ritter has made commitments to achieve an increase in the renewable energy sources powering our state from 10 percent to 20 percent and adding energy-efficiency requirements such as those specified by LEED to construction standards for state buildings.

The Construction Technology Cluster is responding to these national and state trends. Through partnerships with industry the CTC will continue to pursue curricula that ensures that graduates

are prepared for the 21st century construction industry. Through partnerships with entities such as the U.S. Green Building Council the CTC provides integrated curriculum promoting the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ . LEED offers guidance, curricula and certifications in the building and sustaining of energy efficient buildings. The CTC is pursuing efforts with the North American Board of Certified Energy Practitioners to become a certification center for Solar Thermal and PV Installers.

Fine Woodworking FIW

Job prospects will be best for highly skilled woodworkers who produce customized output, which is less susceptible to automation and import competition, and for those who know how to operate computerized numerical control (CNC) machines. The current space allocation for FIW is roughly 9,500 sf. The following sections describe the expansion plans for 7,000 sf additional space based on existing program and workforce demand.

The Cabinet Makers can no longer remain competitive without the incorporation of some high-tech machinery now used in the industry. To master the skills expected by industry students must have access to computer controlled routers and other computer controlled machinery.

High-end carpenters (interior finishes) are one of the most highly sought employees. To keep pace with the demand for green building students must learn to use the right materials in order to preserve the environment. It has been proven that a "built green" house will last longer and is less expensive to maintain than a traditionally built home. Students must understand the importance of educating their customer base of the return on investment when planning new structures using green build principles.

FIW is expanding into another high demand occupation of building and repairing musical instruments. Three years ago we began with one small guitar building class. Now we are creating a whole new stand alone program. This program continues to grow, even surpassing the growth rate of the furniture classes. This growth continues despite the fact that we are forced to teach these classes in an area most colleges would consider a small storage facility. Our course selection now includes guitar, mandolin, electric guitar, and violin.

Industrial Science and Operations Department ISOD

As a major industry vital to the competitiveness of

[3] US Department of Energy, 2006. Energy Efficiency and Renewable Energy. www.energy.gov

virtually every other industry sector in our state, the concerns voiced by the process industries of the energy sector and advanced manufacturing partnering with Red Rocks Community College (RRCC) must be a high priority. The concerns of these employers center around two major issues (1) looming retirements will require replacing more than 60 percent of the technical workforce over the next five years, and (2) the lack of a qualified operator and technician candidates for employment due to technological advancements in response to consumer demand for cleaner and more efficient energy sources and products. Process operators and electro-mechanical maintenance technicians are referred to as "multi-industry occupations" under the in-demand jobs section of the U.S. Department of Labor's http://www.careervoyages.gov/ website due to the fact that these jobs are found in both energy and advanced manufacturing high growth sectors.

In 2005, President George W. Bush signed into law the first national energy plan in more than a decade. The Energy legislation lifted restrictions for drilling permits on BLM lands. The RAPT partners EnCana and BP have announced plans to increase natural gas drilling in western Colorado. To date western Colorado has seen a 100 percent increase in the number of drilling permits issued for a total of more than 3,000. Below the Roan Plateau in Garfield County sits 5.2 trillion cubic feet of gas enough to heat 2.5 million homes for twenty years! The unprecedented demand for skilled oil and gas workers has resulted in the import of labor to Colorado. The fact that energy producing employers are importing workers to a state that has a 4.9 percent unemployment rate is sending a wakeup call concerning the lack of workers in Colorado with the skills needed for the process industries in Colorado.

Colorado Representative John Salazar was quoted in the Rocky Mountain News, August 10, 2005. Representative Salazar is not pleased with the import of Chinese gas rigs and workers to drill on Colorado's Piceance Basin in Garfield County. "There are plenty of people in rural Colorado who need good paying jobs and could do the job if we just took the few months to train them."

Xcel Energy is opening a new plant in Pueblo about ninety miles south of Denver. A career fair was held to recruit the more than 1,000 crafts persons that will be hired as maintenance workers. Organizers expected more than 1500. These new jobs are in a community with an unemployment rate of 5.9 percent, one of the highest in the state. Less than 400 people attended the fair. One of the fair organizers was quoted as stating his major concern about the "skill levels among today's young people." A follow up article a few days latter quoted an energy industry representative in his statement that it is "easier to find a brain surgeon than an electrician to come to your house." In our zeal to encourage young people into postsecondary education we are losing site of the importance of ensuring our postsecondary options are aligned with the needs of the workforce. The graphic compiled from the U.S. Bureau of Labor Statistics data depicts the looming crisis as America's workforce ages and by 2012 we will quite literally have more jobs than people!

Student enrollment in the ISOD is anticipated to increase over the next 2 to 3 years with a total enrollment averaging 300 students per year taking an average of 6 – 9 credit hours. Students will be derived from three primary sources:

- High school graduates, with the primary sources being the Denver area county school systems;
- People changing careers due to displacement and/or personal choice;
- Incumbent workers from the industries seeking to improve or change positions.

The industry demand for individuals with certificates and AAS degrees in both areas will peak in 3 to 5 years and hold steady for an additional 3-5 years. This will be due to three primary factors:

- Regional growth in the basic energy and process industries in the Front Range region and across Colorado;
- The generational shift between the "Baby Boomers" and the "Boomer Echo" generation.
- The rapid change in technology requiring additional training and individual skill development.

Incumbent training will follow the peak in new worker training and will continue for another 7-10 years.

- Workers skilled in the PRO and IMT curricula will be required by both major, well known, industries, such as Xcel Energy, Suncor and Molson-Coors but also by the mid-level firms engaged in the supply and production of foundational products
- Licensure of process operators working in PSM (Process Safety Management, OSHA 1910.119) environments and processes.

Factors contributing to the growth potential in both the PRO and IMT programs include:

- Anticipated need for 100 to 150 operations-trained personnel per year for 3-5 years at a local consumer products producer. A significant portion of these people could be part of a work-study program that would require attendance at the PRO or IMT programs.
- Development of similar work study programs with other major and mid-level industries.
- An apprentice maintenance program for current operators with the talent and interest in developing maintenance skills.
- Affiliation and coordination with the bargaining units associated with the major energy and process industries.

2.4 Relation to Academic or Strategic Plan

CCCS' three strategic priorities are Student Access, Student Success, and Operational Excellence. Access refers to specific activities to recruit and retain students with a priority in increasing the participation of underserved students. Success refers to improving completion or graduation rates of students, and improving Career and Technical Education (CTE) efficiency and effectiveness. Operational Excellence is measured through processes that demonstrate fiscal accountability and program delivery that meets the needs and expectations of students and stakeholders.

Construction Technology Cluster CTC

CTC has demonstrated continued success in developing programs in high schools that promote the construction industry through the contextual teaching of academic competencies. The math course Geometry Principles for Construction, was developed as part of a National Science Foundation grant received by the CTC. Math and construction technology faculty teamed to develop a math program that uses real world construction principles of measurement and angles to help students see the relevance of math in careers. The course has expanded rapidly throughout Colorado and nationally. High school students may earn college credit that will transfer into the CTC upon college matriculation by completing the introductory construction technology courses CON 110 and 111.

The new Introduction to Energy Technologies course ENY 101 is also taught in the high schools for college credit. Efforts are underway to seek Jefferson County School District's approval to teach the course for high school science credit. This course is a project-based look at energy conservation, renewable methods of generating electricity including solar, wind, biomass, hydrogen (fuel cells) and geothermal. This group of courses will count for credit for community college ENY 101 for AAS construction technology credits. The students are showing a high degree of interest, which translates into students looking for work right out of high school. A chart of the enrollment by high school is attached.

Engaging students in career paths in high school with direct transferability to college level programs has a demonstrated result of increasing not only high school graduation rates but college matriculation rates as well. Students set career goals that motivate their education plans well beyond high school.

CTC has worked closely with community organi-

Program Information

zations serving under and unemployed individuals. Through partnerships with MiCasa Resource Center and the Jefferson County Workforce Center single parent females complete intensive job training programs that have included home and apartment maintenance introductory carpentry and plumbing. Job placement of the individuals completing the intensive training programs has consistently exceeded 60 percent.

The CTC Program Coordinator has been invited to serve as part of the RTD Workforce Diversity Summit. The purpose of the Summit is to engage employers in the construction industry to develop trade professionals from underserved populations. RTD is spearheading the effort in anticipation of the workforce needed for the major projects on the horizon that include Fast Tracks and the Union Station redevelopment.

In January 2007 RRCC opened four Community Learning Centers (CLC). The Centers are strategically located to increase the outreach to individuals least likely to pursue postsecondary education due to barriers that include ESL, and/or poor basic skills. The Centers are located at two at- risk high schools in Jefferson County, the Jeffco Workforce Center, and at the Jeffco Action Center which provides emergency services to homeless and under and unemployed. Clients of the Community Learning Centers will have one-on-one assistance from onsite RRCC coordinators working closely with Workforce Center case managers in identifying career options and developing detailed plans that include basic skill remediation, ESL and tutoring to prepare individuals to complete the training and education needed and offered by RRCC to succeed in high demand high wage employment that includes construction technology and process technology.

The Centers will feature multi-media presentations prepared by employers and website connections that will help clients map career pathways and develop education goals that will prepare them for employment in construction technology and process industries. Jefferson County Schools career and guidance counselors and staff from Jefferson County Workforce Center (JCWC) will assist the RRCC CLC coordinators in working with CHOICES software used in all Jeffco schools to complete “Plans of Study” which will be modified to align with the new Carl Perkins legislation. The RRCC CLC coordinators will cross train with JCWC case managers to become certified Global Career Development Facilitators.

Process Technology High School Enrollment	Fall 2005	Spring 2006	Fall 2006	Spring 2007
Alameda PRO I : PRO 100	30	30	60	47
Alameda PRO II: PRO I00 Seniors (2nd Year)	12	12		13
Jefferson High School PRO I : PRO 100	8	8	54	45
Brady Exploration PRO I : PRO 100	5	5	20	20
Golden American Chemical Society Modules (1st Year)	15	15	85	82
McLain Community American Chemical Society Modules (1st Year)	10	10		19
Total	80	80	219	226

Industrial Science and Operations Department ISOD

RRCC's industry partners, Jeffco Workforce Center, Governor's Office of Workforce Development, and CSM's CERI have committed a total of $150,000 in cash contributions to purchase the Mobile Training Center. The 35' high-tech trailer has been ordered. The Center will then be ready to travel throughout the nine county metro region introducing students, parents, counselors, and adults seeking new career options to the "gold collar" employment in energy and advanced manufacturing.

A Partnership with the Jefferson County School District since 2005 has resulted in the development of an 11-14 grades pipeline. The college level PRO 100 Introduction to Process Technology is taught as a science course in the participating high schools. To date more then 200 high school students from six high schools are enrolled in the process technology science courses.

The Science and Technology Preview Summer Bridge Program prepares high school students for the transition to college. The first annual 2006 summer program had 30 students enrolled

2.5 Relation to Other Programs/Outside Agencies

Construction Technology Cluster CTC

The graduates of the CTC have a remarkable success rate, with 96 percent passing the difficult EPA Refrigeration Recovery Certification test on the first try. "The completers of the Construction Technology Cross-Connection Backflow Prevention exam have a 95 percent success rate versus a 40 percent success rate statewide" [Courtney Arford, International Association of Plumbers and Mechanical Officials (IAPMO), Board of Directors]. To ensure the continuation of these extraordinary success rates, the CTC needs tools and updated equipment to revitalize and/or create new labs to keep pace with changing industry demands over the next five years.

The Construction Technology Program is supported by industry leaders that include local building officials and inspectors in addition to industry representatives from Genesee Heating, Setpoint Systems, Integrated Control Systems, Arappco Engineering, Bell Plumbing and Heating, and Lockheed Martin, Haselden Construction, Milender White Construction Company, The Weitz Company, Mortensen, and Palace Construction, Confluence Builders, OE Construction, Waner Construction, Avitar Construction, Long Mechanical Solutions, Saunders Construction, Comfort Air, Western Building Services, Advanced Hydronics, and American Mechanical. In addition to reviewing and advising concerning curricula content and teaching practices these employers offer jobsite tours, job shadows, classroom volunteers and material donations. The employers have seen a return in their investment in that annually the graduates of the Construction Technology Program earning a degree or certificate have achieved at least ninety percent employment placement.

Industry partners contribute to the CTC by

- providing input in development and revisions of curricula
- validating educational objectives on a regular basis
- identifying changes in standards or legislation affecting the program
- updating skill standards
- establishing certification and licensing procedures
- offering professional development opportunities for RRCC instructors
- targeting new programs or offerings to meet industry needs
- generating support through public awareness campaigns and community-building activities
- evaluating programs, and
- providing work-based learning experiences for RRCC students.

Program Information

At the request of the Associated General Contractors of Colorado (AGC) the Construction Technology Program has adopted the AGC Supervisory Training Program curriculum and is collaborating with employers to expand supervision and management courses. Representatives from Saunders Construction, Avitar Construction, Hensel Phelps Construction Co., Waner Construction, Broomhall Brothers Heating and Plumbing, Design Mechanical, US Facilities, and Advanced Hydronics are contributing time to redesign the two-year construction management degree program to provide a conduit for experienced tradespeople to enter the supervision and management ranks.

Kinder Morgan has sought out the CTC to provide incumbent worker training through customized block training offered in the CTC facilities during the week day when class and lab space is more available. As the technology advances in the HVAC field, and throughout the construction industry incumbent workers require continual education. Partnering with the CTC was a cost effective solution to address Kinder Morgan's immediate workforce education needs. Other organizations have sought the educational resources of the CTC that include Association of Women in Construction, Associated General Contractors and the Governor's Office of Energy Management.

Marketing the ability of the CTC to customize employer training for industry partners has the capacity to generate enterprise revenue that can support program and facility upgrades, however due to space limitations it is not feasible at this time to fully develop this opportunity.

Articulation agreements with four-year colleges such as Colorado State University and Metro State College enable students to pursue a baccalaureate degree program.

Industrial Science and Operations Department ISOD

A recent job description for Suncor Energy's Oil Refinery in Commerce City noted the increased educational preference that included an associate's degree in Process Technology. BP America has declared similar requirements adding that entry level process operators must possess knowledge in advanced math, physics and chemistry.

Process operations in the oil and gas industries are becoming exceedingly more complex with stricter environmental regulations. Suncor Energy, along with most of the energy employers in Colorado, have been reduced to recruiting skilled workers from outside Colorado that tend to have higher turnover rates, or settling for less qualified workers and being forced to divert company resources into costly training. These workforce issues have lead the energy employers and advanced manufacturing employers in Colorado to join forces to address the shortage of workers with the knowledge base and experience required to work as process operators and electro-mechanical maintenance technicians.

These industries all share similar concerns with the shortage of workers adequately prepared for employment as process operators and multi-craft technicians with both electrical and mechanical skills. With starting salaries above $40,000 a year, these are "gold collar" employees. Over the next five years, more than forty percent of these skilled workers are expected to retire. The looming shortage of these technicians has mobilized the manufacturing industry. Locally, some industries are already feeling the effects of a changing workforce.

Hank Ward, Corporate Reliability Engineer for Coors Brewing Company, explains the synergistic partnership with Red Rocks. "Our collaboration with Red Rocks has resulted in a partnership providing substantial benefit to not only Coors and the College, but Jefferson County's workforce as well," says Ward. "We will advise Red Rocks in developing industry- specific curriculum and in return, we will receive the benefits of a technical workforce with the breadth and depth of skills created for area-specific systems and related equipment."

Coors is facing retirements which have resulted in more than 150 open requisitions for skilled craftspersons. Coors is brokering a partnership between a temporary labor contractor and the College to create a development opportunity that would allow temporary labor workers to complete college coursework while working part time at Coors. These workers could have a highly increased likelihood of securing a permanent position at Coors after completing this innovative work-study

program.

Ken Losasso, Training Supervisor for Suncor Energy USA notes the constraint felt by most process industries in Colorado as result of the diminished pool of qualified workers as the technical knowledge for employment increases. “We now require an Associate’s or Technical degree for consideration of employment so the opportunity to partner with Red Rocks Community College is a viable, proactive strategy to recruit and train highly skilled process workers.” Suncor Energy along with several other industry partners have donated equipment, cash for scholarships and cash for the purchase simulators for the laboratories and classrooms of the ISOD program. Suncor Energy will be recognizing a return on their investment as their new hire class of 2007 will be completing distillation training and steam generation training in the laboratories of the college. This real example the symbiotic relationship between industry and education results in wins for both partners; industry is able to reduce duplication of training facilities and education has gained a state of the art laboratory for use by all students.

2.6 Existing Programmatic/Operational Deficiencies

Construction Technology Cluster CTC

In 2001, the building that houses the classroom and laboratories of the Construction Technology Program scored a 51.49 out of 100 on the facility index on the state building facility audit. This ranking was concerning four years ago, it has become alarming today.

The current construction program has outgrown the present facility, resulting in potentially unsafe conditions due to overcrowding in shops and labs. Many construction classes are currently housed in six temporary buildings at the College, some of which are archaic and in disrepair. The construction technology program is severely limited in it’s ability to respond to employer and student demand for expanded coursework in new technologies and supervision skills.

Plans to develop the cross purpose plumbing/HVAC and solar thermal labs with remote monitoring of the PV energy generation are dependent on space availability.

All available spaces are consistently utilized during the evening course slots, there is no lab space available to add new equipment and technology and there is a constant struggle to maintain the low instructor/student ratios that optimize technical learning.

Discussions are underway to discontinue the Carpentry framing and remodeling courses as the space limitations do not allow the safe construction to full size projects. The carpentry program at RRCC has continued to lose enrollment as the competition for space has reduced the course offerings. If the space were available to accommodate the building of full size projects the carpentry program is projected to grow from the existing 10 FTE to at least 60 FTE within three to five years. The following section details the program outline for the carpentry program developed in partnership with industry.

- Students begin by designing a floor space within the predetermined space which would maximize the use of the sun, and minimize building materials.
- Over the subsequent year the students would frame and dry-in a small house. The culmination of the project would be infrared photographs of the structure in order to detect and analyze the buildings ability to conserve heat.
- The next semester would introduce the skills required to complete the interior finish of the home through the FIW courses. The finish work would include the installation of cabinets made in the cabinetmaking courses, countertops, and custom trim.
- The final semester would culminate with the final mock sale of the small home. In which students would learn about the business aspect of the construction trade. The cabinets could be sold as a set, or perhaps donated for the cost of materials to Habitat for Humanity. The house itself could be sold as a playhouse or as a shed.

Proceeds from the sale of the end products created by the students could help sustain the materials costs for the courses.

Program Information

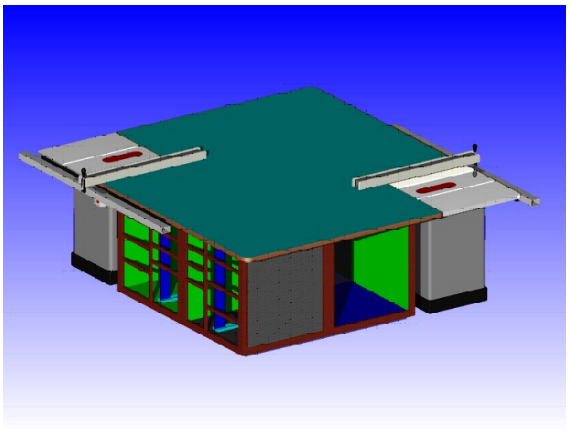
Fine Woodworking FIW

FIW has had to postpone the acquisition of computerized numerical control (CNC) or computer controlled routing machines due to lack of space. With the proper facility, and machinery used widely in the woodworking industry RRCC would have the only CNC training facility in the Mid-West. As technology causes the prices for CNC to continue to drop, CNC machinery are becoming the standard for cabinetmaking and crafting other fine woodworking products. With the addition of a CNC FIW is projecting a growth of 30 FTE within three years. The CNC would require an increase in floor space of approximately 1,500 sf.

All available spaces are consistently utilized during the evening course slots, there is no lab space available to add new equipment and technology and there is a constant struggle to maintain the low instructor/student ratios that optimize technical learning. The FIW program has made the following temporary fixes in an attempt to maximize the quality and efficiency of the learning environment:

Two New Hand-tool cabinets

- Over the past four years we have seen a dramatic increase in the number of students desiring to learn to proper use of hand-tools. While hand-tools can't replace power tools in a successful business they do offer a method for students to stand-out from their competition. Besides often a hand-tool can complete a task much more efficiently than a power tool ever can.
- This move allowed us to eliminate two rolling carts that had been stored in the "tool-crib"



Sister Two Table saws

- This is a very unusual arrangement that many local cabinet shops have now adopted.
- It allows two cabinet-saws to function in the same space as one.
- Created more storage so that we could move tools out of the tool-crib

Tool-Crib remodel

- With the rolling carts removed, and many tools relocated to the Table saw Cabinets we have been able to make the tool-crib a small instructional classroom.
- This classroom has one small bench and is a great teaching space, which is isolated from the main shop. This allows students to focus on education in a quieter and more student friendly environment.

Finish Area Remodel

- The finishing area was located in the upper deck of the shop.
- We have created a temporary space for instruction in the practice of finish application by moving the finishing area.

Other more general improvements:

- Built tool cabinet for hand tools
- Sharpening station
- 2 miter saws cabinet-set-ups
- Built 3 new router tables
- Rearranged power tools and work benches to obtain optimal usage of space
- Expanded Lathe area to make it safer and more spacious
- Altered cabinet to consolidate all turning tools
- Moved glue-up area to upstairs
- Moved multiple work benches to upstairs
- Built vertical storage for wood
- Tore out wall under stairs
- Built 4 new work benches
- Built new cabinets for guitar area
- Rearranged guitar area upstairs
- Built humidified storage closet for guitars (5' x 14')
- Tore out storage area above spray booth to make more floor space (10'x10')
- Built new wall and cubbies for student storage upstairs
- Built new clamp racks to better utilize space
- Had carpentry class built addition to bridge
- Dismantled old horizontal storage

- Built new vertical and horizontal storage
- Removed ½ of veneer cabinets
- Built storage for students finishing boards

Industrial Science and Operations Department ISOD

The Industrial Science and Operations coordinator has convened an employer task force to design the laboratories according to the standards and practices found in each of the partnering process industries from across Colorado. The task force drafted general space allocation. The approximate 3,000 square feet that would be needed to meet the minimum laboratory requirements as specified by industry is more than twice that of the space currently available to the program. This initial space needs assessment was clarified and modified during the program plan process. Results are included in the Facilities Needs section.

The following unit processes were identified as having general applicability to all member industries at this time.

- Steam Generation
- Distillation (vacuum, 2 component)
- De-ionized Water Production
- Potable water production
- Waste Water Treatment (pH neutralization, filtration?)
- Fluid Handling
- Batch Processing (Fermentation? Biotech focus)
- Alternate or potential processes:
- Packaging conveying and material handling loop with QC process to include discrete container handling
- Alternative energy generation processes

These unit processes can be designed as interconnected plants exactly as found in industry. This design has been developed and refined in colleges along the Gulf Coast that have a long history of developing curricula and laboratory plants for the energy and chemical industry. The photo array below depicts the plants in operation in Brazosport College in Texas City and Western Wyoming Community College in Rock Springs.

Plant A Fluid Handling

Plant C Vacuum Distilation

Plant B Water Deionization Unit

APPROXIMATE DIMENSIONS:

AREA	WIDTH	LENGTH	HEIGHT
CONTROL ROOM	24’	24’	10’
SAMPLE AREA	12’	8’	10’
OFFICE	12’	8’	10’
SWITCH GEAR/STORAGE	24’	12’	10’
PLANT E	24’	24’	20’
PLANTS A, B, C, D, & F	24’	50’	10’

2.7 Program Alternatives

The education programs reflected in the program plan prepare workers for two of the fastest growing industries in Colorado: energy production and manufacturing, and construction. The inability to respond effectively to the employment demand of our industry partners because of space and the aging of the physical plant leaves little to no program alternatives. The high-touch and high-tech preparation required to ensure that our graduates are job ready cannot be conducted virtually. Students must learn and demonstrate industry standard competencies and safe work habits in fully equipped state of the art classrooms and laboratories.

The programs currently offer alternative education opportunities that include instruction in the workplace and online learning. Internet courses have been developed by each program to support the theoretical knowledge, however, the technical demonstration of the mastery of the skills required by the programs impacted in this plan require high touch instruction with the equipment and materials found in industry. Alternative space is utilized at area high schools when appropriate, such as the brick laying class held at Warren Tech. Through an innovative partnership with Denver Public Schools Career Education Center high school students will complete one credit modules that will transfer with college credit using PSEO as Construction 110 and ENY 101 and also count toward high school graduation.
Each program has benefited from donations of equipment from industry which has enhanced the learning environment and kept the programs reasonably current in spite of budgetary constraints. Red Rocks Community College anticipates this stream of resources will increase dramatically as a direct result of the new facility.

3.0 Facilities Needs

3.1 Total Space Requirements

The space need allocation table contained within this section is a summary of the room-by-room space needs table found in the appendices of this program plan. The space plan for the Construction Technology Cluster (CTC) and Industrial Science and Operations Department (ISOD) at Red Rocks Community College includes the following space categories:

Room Use Code (RUC) 210s: Teaching Laboratories
RUC 220s: Open Laboratories;
RUC 300s: Office
RUC 500s: Special Use
RUC 600s: General Use
RUC 700s: Support Facilities

The total amount of assignable square feet (ASF) is approximately 80,000, 69,200 ASF for the academic programs and 10,800 ASF for Physical Plant.

Academic Program Summary by Space Category	Recommended ASF
Teaching/Open Laboratory Service ▪ RU C 200s	52,455
Offices & Office Services ▪ RU C 300s	4,170
Special Use Facilities ▪ RU C 500s	9,972
General Use Facilities ▪ RU C 600s	1,500
Support Facilities ▪ RU C 700s	1, 080
Total Academic Assignable Square Feet (ASF):	69,177

Physical Plant Program Summary by Space Category	Recommended ASF
Offices & Office Services	2,300
Support Facilities	8,500
Total Physical Plant Assignable Square Feet (ASF)	10,800

The following sections detail the space requirements by room use code. The space requirements are detailed by program area.

Teaching Laboratory (RUC 210s) and Open Laboratory (RUC 220s)

Teaching Laboratories (210s room use code) are defined as rooms used primarily by scheduled classes that require special purpose equipment to serve the needs of particular disciplines for group instruction, participation, observation, experimentation, or practice. Station sizes in teaching laboratories vary by discipline.

The space classified as open laboratories includes rooms that are open for student use and are not used on a regularly scheduled basis. These rooms may provide equipment to serve the needs of particular disciplines for group instruction of informally or irregularly scheduled classes. Alternatively, these rooms are used for individual student experimentation, observation, or practice in a particular field of study. The size of these laboratories is based on equipment size and/or on the station size and student count desired. Types of rooms in this category include computer laboratories, language laboratories, music practice rooms, and tutoring and testing facilities.

Construction Technology Cluster

The Construction Technology Cluster (CTC) consists of programs including: Electricity and Fire Protection; Plumbing; Heating; Air Conditioning/ Refrigeration; Energy Technology; and Carpentry. Fine Woodworking & Applied Arts is technically a program under the CTC, but is an effective stand-alone program. The following paragraphs describe the teaching laboratory space needs for the various CTC programs.


Electrical Mock-up Station

Facilities Needs

The Electricity and Fire Protection program requires a residential electrical mock-up laboratory, a commercial electrical mock-up laboratory, a programmatic logical controllers laboratory, a fire alarms laboratory, a motor controls laboratory, and an AC/DC fundamentals laboratory. The 24-station residential and the 20-station commercial electrical mock-up laboratories consist of individual stations comprised of mock-ups. The 20-station fire alarms laboratory consists of various fire alarm systems mock-ups. The 20-station motor controls laboratory and the 20-station AC/DC fundamentals laboratory provide space for specialized electrical instruction. Space is also allocated for a tool crib, equipment storage, and materials storage.

The Plumbing Program includes a 12-station commercial plumbing mock-up laboratory, a 12-station residential plumbing mock-up laboratory, a 12-station underground plumbing mock-up laboratory, and a 6-station backflow mock-up laboratory. The commercial and residential plumbing mock-up laboratories should be located so that students can flow between these laboratories and the underground plumbing and backflow mock-up laboratories. The commercial and residential plumbing mock-up laboratories provide space for various installation techniques and require three-dimensional clearance for each student station. The underground plumbing mock-up laboratory should have a dirt floor and be located under a mezzanine level floor system to provide an environment similar to the lower-level/basement of a structure. The back-flow mock-up laboratory is a wet-laboratory environment. Space for a tool crib, equipment storage, and materials storage is also included.

A 16-station heating laboratory, a 12-station sheet metal laboratory, an 8-station welding/braising laboratory, tool crib, equipment storage, and materials storage are allocated for the Heating Program. The heating laboratory includes workspace for students to develop skills towards repair of various heating units. The sheet metal and welding/braising laboratories are in support of the heating laboratories. The sheet metal laboratory provides space for equipment such as a brake, which is used for bending metal. The welding/braising laboratory will house individual stations for gas and heliarc welding.

The Air Conditioning/Refrigeration Program includes a 14-station building automation laboratory, a 14-station controls room, a 14-station heavy commercial kitchen laboratory, a 14-station heavy commercial refrigeration laboratory, a tool crib, equipment storage, and materials storage. The building automation laboratory provides an environment for experience with building automation devices. The controls room includes space for pneumatic controls used to direct commercial and industrial equipment. The heavy commercial kitchen laboratory focuses on techniques for repairing commercial kitchen equipment. The heavy commercial refrigeration laboratory focuses on the repair of building air conditioning units such as those typically found on rooftops.

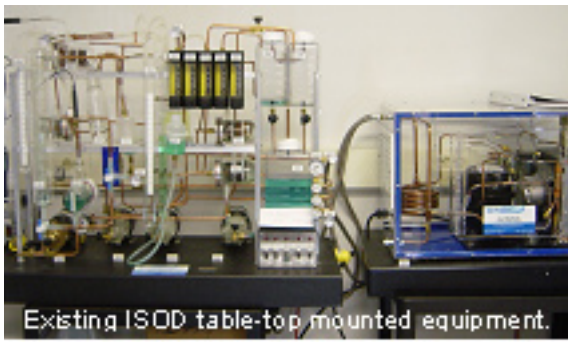
A 24-station renewable technology laboratory and storage space for associated tools, equipment, and materials is required for the Energy Technology Program. The laboratory includes various pieces of table-top mounted equipment and some floor located pieces for investigation of renewable technologies. The laboratory requires access to a secure exterior work area with appropriate lighting for installation of equipment such as solar panels.

The Carpentry Program includes a 24-station high-bay residential mock-up laboratory, tool crib, equipment storage, and materials storage. The residential mock-up laboratory includes sufficient floor space to allow several frame-up projects for various courses to occur simultaneously.

Facilities Needs


Existing Fine Woodworking & Applied Arts finishing area.

The Fine Woodworking & Applied Arts Program serves various courses including those with topics such as cabinetmaking, strip canoe building, lathe turning, door making, furniture repair, steel string guitar construction, among others. A teaching laboratory that includes a floor tool area for lathes, tables saws, jointers, etc., a 16-station hand tool area comprised of workbenches, and a 16-station woodworking/carving area are required. An computer 8-station computerized numerical control (CNC/CNA) computer laboratory in support of the CNA equipment should be located adjacent to the floor tool area (the floor tool area includes the CNA equipment). A finishing area laboratory and finishing area demonstration room should be adjacent to, but separate from, the floor tool area. The finishing area laboratory will be used to apply finishes following production of a piece and is comprised of bench/table workstations for individual's use. The finishing area demonstration, while serving as an overflow space for the finishing area laboratory during peak periods, will be primarily used for instruction of finishing techniques. Support spaces include an enclosed walk-in paint booth so that larger pieces such as a chair can be hung to spray, an environmentally controlled room for humidifying specialty woods, individual's project secure project storage for works in progress, and support spaces include a tool crib, equipment storage, and materials storage.


Existing ISOD table-top mounted equipment.

Integrated Science & Operations Department

Integrated Science & Operations Department (ISOD) is comprised of programs in Process Technology, Industrial Maintenance, and Water Quality Management.

The Process Technology Program requires a 16-station process technology laboratory with an associated 16-station operation control room. The process technology laboratory provides floor space for program related equipment such as a DTU-2 Distillation Training Unit, Steam Generation and Handling Unit, Flow Temperature and Level Control Simulators, Pump Station, Mechanical Drive Learning System, and various models of energy industry components. Simulations, such as digital power generation, can be run from the operation control room. Space for tool crib and materials storage has been included. A display area within or near the laboratory allows unique and specialized equipment to be showcased.


Existing ISOD equipment.

Facilities Needs

The Industrial Maintenance Program includes two 16-station rotating equipment laboratories, a 24-station pipe-fitting and welding laboratory, and a dedicated equipment laboratory. The rotating equipment laboratories provide flexibility for program delivery and have open floor plans into which various types of equipment can be used. One of the rotating equipment laboratories will have bench workstations for equipment such as motors, pumps, and compressors, which can be mounted on movable workstations for hands-on experience with disassembly, reassembly, and cold alignment training. The other rotating equipment laboratory provides space for fluid powers (e.g. hydraulic systems) as well as being an opportunity for rotating modular training units. The pipe-fitting and welding laboratory has individual welding stations and floor area for constructing and testing various pipe-fit configurations. The dedicated equipment laboratory will house several large-scale pieces of equipment connected to the control room. Materials storage is larger than that for other programs with the understanding that equipment would be stored and used on a rotating basis within the laboratories rather than being permanently installed thereby reducing the overall teaching laboratory space required. A machine shop will include metal lathes, a milling machine, and heavy duty/machining workstations. Space for materials storage, a tool crib, and individual's project storage is also allocated.

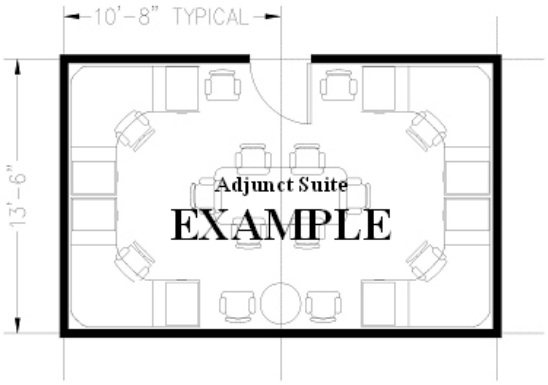
The Water Quality Management program requires a 16-station water chemistry analysis laboratory and a 16-station pilot water treatment/waste water treatment laboratory. Associated materials storage is also allocated.

Several spaces are provided for general use. A tutoring/study area for students within the CTC and ISOD, which has 16-stations, should be provided. A general computer laboratory of 24-stations should also be included.

Offices and Offices Service (RUC 300s)

The guideline application for office space needs is based on major categories of staff types and the additional application of space amounts for office service and conference areas.

The program plan analysis assumes that a central shared office space will house an administrative assistant within a reception area to provide identity and a point-of-presence at the main door to the building. The shared office area will also include a 16-person conference room, workroom (copier, office supplies, etc.), and a file room.



Construction Technology Cluster

The Construction Technology Cluster has five faculty and multiple adjunct faculty. The CTC proposes to add two additional faculty as well as adjunct faculty by the target year in support of increasing student enrollments. Therefore, private office space has been allocated for all full-time faculties. An adjunct faculty allocation has been included that will provide shared hot desks and possibly a conference table/meeting space.

The Fine Woodworking & Applied Arts Program includes one full-time faculty person as well as technical staff. A private office has been allocated for the full-time faculty person and a shared office for the technical staff. An adjunct faculty office allocation is also provided.

Integrated Science & Operations Department

The Integrated Science & Operations Department has a program coordinator/faculty and two full-time faculty as well as adjunct faculty. ISOD proposes to add three full-time faculty and adjunct faculty by the target year in support of increasing student enrollments. Private offices were allocated for the program coordinator/faculty and the full-time faculty. An adjunct faculty office allocation is also provided.

Facilities Needs

Integrated Science & Operations Department

The Integrated Science & Operations Department has a program coordinator/faculty and two full-time faculty as well as adjunct faculty. ISOD proposes to add three full-time faculty and adjunct faculty by the target year in support of increasing student enrollments. Private offices were allocated for the program coordinator/faculty and the full-time faculty. An adjunct faculty office allocation is also provided.

Physical Plant

Physical Plant has a director, two administrative assistants, a key shop/office attendant, two mailroom personnel, and ten maintenance staff. Included are an 8-person conference room, a reception area, and storage space. With the exception of the maintenance staff, which need to be located adjacent to the maintenance shop, the remainder of the physical plant personnel may be collocated with the academic personnel.

Special Use Facilities (RUC 500s)

Special Use Facilities include room use categories that are sufficiently specialized in their primary activity or function to merit a unique room use code. Demonstration classrooms, which are rooms used to practice activity within an instruction program the principles of various disciplines, are within this classification.

The academic methodology of the CTC and ISOD include hands-on application of the curriculum within a safety-minded environment. Therefore, the programs intend to provide instruction on safety and techniques within a classroom environment prior to moving into the laboratories.

The demonstration classroom allocation assumes that during a typically course period (6:00p to 10:00p) there are three hours of use and each course will, on average, use the room for one hour per instruction period. Based on this concept, a demonstration classroom for every three teaching laboratories in the program analysis was provided. The number of stations within the demonstration classrooms is relative to the teaching laboratory capacity.

This resulted in total of eight 20-station, four 24-station, and one 40-station demonstration classrooms.

General Use Facilities (RUC 600s)

General Use Facilities are characterized by a broader availability to faculty, students, staff, or the public than Special Use Facilities, which are typically limited to a small group or special population.

The program analysis includes an arrival space, community space, and a vending/self-service area within this space category. The arrival space is intended to serve as both a communal entry to the building in lobby-fashion as well as be a gallery/display area for the academic programs to heighten awareness of the CTC and ISOD. The community space is a gathering area comprised of various seating configurations such as bar stools with tables and casual seating. The vending/self-service area includes space for vending machines and a counter area for a microwave(s) and possibly a sink.

Support Facilities (RUC 700s)

Support facilities, which provide centralized space for various support systems and services of a campus, help keep all institutional programs and activities operational. While not as directly accessible to institutional and community members are General Use Facilities, these areas provide support for areas ranging from an entire building to the entire campus.

Areas within this space category include locker rooms, loading dock, short-term dock storage, recycling/trash area, hazardous materials storage, and information technology closets. The locker rooms (one for men, and one for women) are comprised of a small dressing area with lockers and an adjacent restroom containing a toilet, sink, and shower. The loading dock provides delivery access to the building. The short-term dock storage is intended to provide space for deliveries until they can be distributed throughout the building. The recycling/trash area is an interior space for material storage prior to appropriate off-site disposal. The hazardous materials storage is an

enclosed and secure area for storage until the materials can be picked up by outside agencies for appropriate disposal/recycling. The information technology closets provide dedicated space for technology components.

Physical Plant facilities support the entire Red Rocks Community College campus. Included are a receiving area, maintenance shop, and storage facility. These are large, high-bay spaces that accommodate reconfiguration as specific needs change.

3.2 Unique or Special Features

As the only Construction Technology program in the region and with growing CTC and ISOD student enrollments, the supporting facilities are unique within the context of hand-on experiential learning requiring specialized and dedicated learning environments.

3.3 Health, Life Safety, and Code Issues

The most significant of the many reasons for this facility addition and renovation is the substandard and unsafe condition of the existing facility compounded by overcrowding. The building is not in compliance with code. This includes building, fire, ventilation, and egress concerns. The ability to utilize safely the laboratory/shop space will increase with more and better space. As the space has become utilized for more purposes, more people and equipment have occupied the same space and the possibility of collisions (with people or equipment) has increased.

The academic programs and support services that will be located in this building require significant site area for delivery, projects, training, and short-term storage. Shipping and Receiving has daily deliveries by all size and type of truck. Many of the labs/shops receive periodic delivery of large equipment. Direct access by several labs/shops to the out-of-doors will facilitate training that should be learned/tested in real world conditions.

3.4 Site Requirements

The academic programs and support services that will be located in this building require significant site area for delivery, projects, training, and short-term storage. Shipping and Receiving has daily deliveries by all size and type of truck. Many of the labs/shops receive periodic delivery of large equipment. Direct access by several labs/shops to the out-of-doors will facilitate training that should be learned/tested in real world conditions.

The site topography will facilitate direct access on all levels of the building.

3.5 Equipment Requirements

Each program has benefited from donations of equipment from industry. Existing equipment will be relocated. Red Rocks Community College anticipates this stream of resources will increase dramatically as a direct result of the new facility. New equipment will also be purchased as necessary and is included in the budget.

Standard office and classroom furniture/equipment will be required. It is included in the budget.

3.6 Acquisition of Real Property

The property is part of the Red Rocks Community College campus. No acquisition of real property will be required for this project.

3.7 Existing Facilities

Located at the extreme West end of the campus, the existing building houses Construction Technology, Fine Woodworking, Physical Plant, Shipping/Receiving, and the Mailroom. It is a one-story, high-bay building with a mezzanine that does not meet code. Its floor level is congruent with Level 3 of the overall campus/building complex. In order to maximize usable space, temporary mezzanine space has been constructed within many of the existing high-bay laboratories and shops creating significant code violations and life-safety issues.

4.0 Project Description

4.1 Facility Improvements/Scope of Work

The existing Construction Technology building is located at the west end of the campus. The proposed addition is to be located to the northwest of the existing building. The existing building is a one-story, concrete frame, high-bay structure. The three-story addition will have one level below and one level above that of the existing building.

The existing building will be renovated with new systems and interior configuration appropriate for Physical Plant needs, including delivery, maintenance, storage, and mailroom functions. This service group to the College is located adjacent to a south facing delivery/yard area. ISOD Industrial Maintenance will also take advantage of the existing high-bay space.

New construction will provide laboratory and shop space for the Construction Technology Cluster, Fine Woodworking, and ISOD. The majority of this space will be high ceiling (approximately 12 feet). The carpentry lab will be double height, providing the opportunity to construct two-story wood framed structures within the lab. Classroom space is conveniently located on all three levels near the labs, providing the opportunity to move back and forth from classroom to lab/shop setting and also allowing for the use of the classrooms by other departments at appropriate times.

Office space between the three groups in the facility is collocated to encourage a feeling of community. It is located near the entrance to the building to provide a welcoming component for visitors.

The Campus Master Plan indicates the desirability of the extension of the existing main circulation spine through the existing building to a defined entrance at the west end of the campus. This project provides for the future implementation of this connection.

The facility, both renovation and new construction, will meet all applicable codes. During the project design phase, the architects and engineers will prepare a complete code analysis. All spaces will be accessible in accordance with ADAAG requirements. Fire protection systems will be provided throughout the building. It is anticipated that the facility will require new or enhanced utility service connections and that it will be LEED certified.

4.2 Diagrammatic Plans / Sketches

Diagrammatic plans and sections indicating the location of major elements within the existing building and the addition follow.

The floor levels are identified in relation to the existing building. Level 3 is the floor level of the existing Construction Technology building, which is at the elevation of Level 3 of the adjacent existing West End building.

Project Description

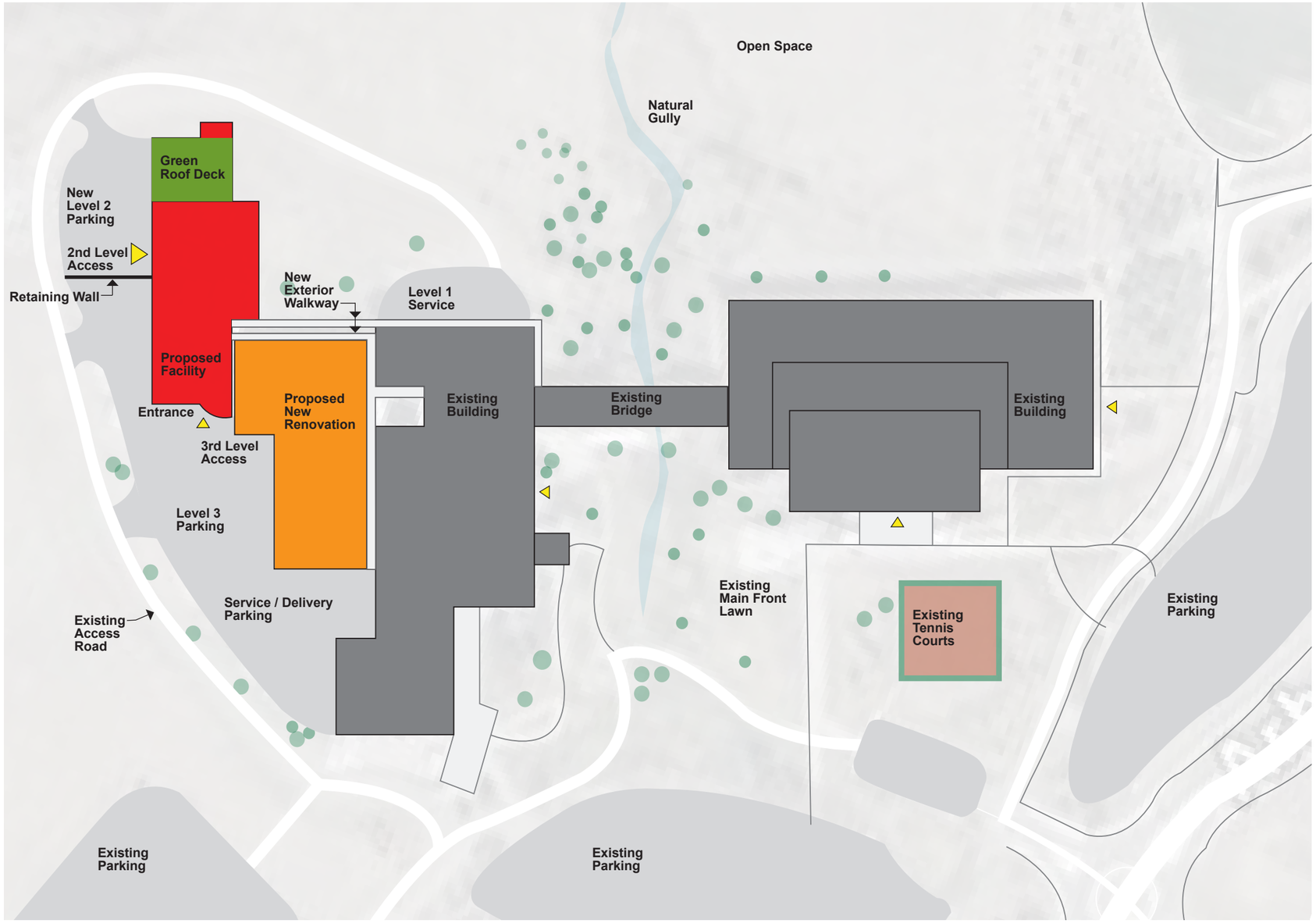
Project Description

New Addition

Renovation

Existing Building

Building Entry

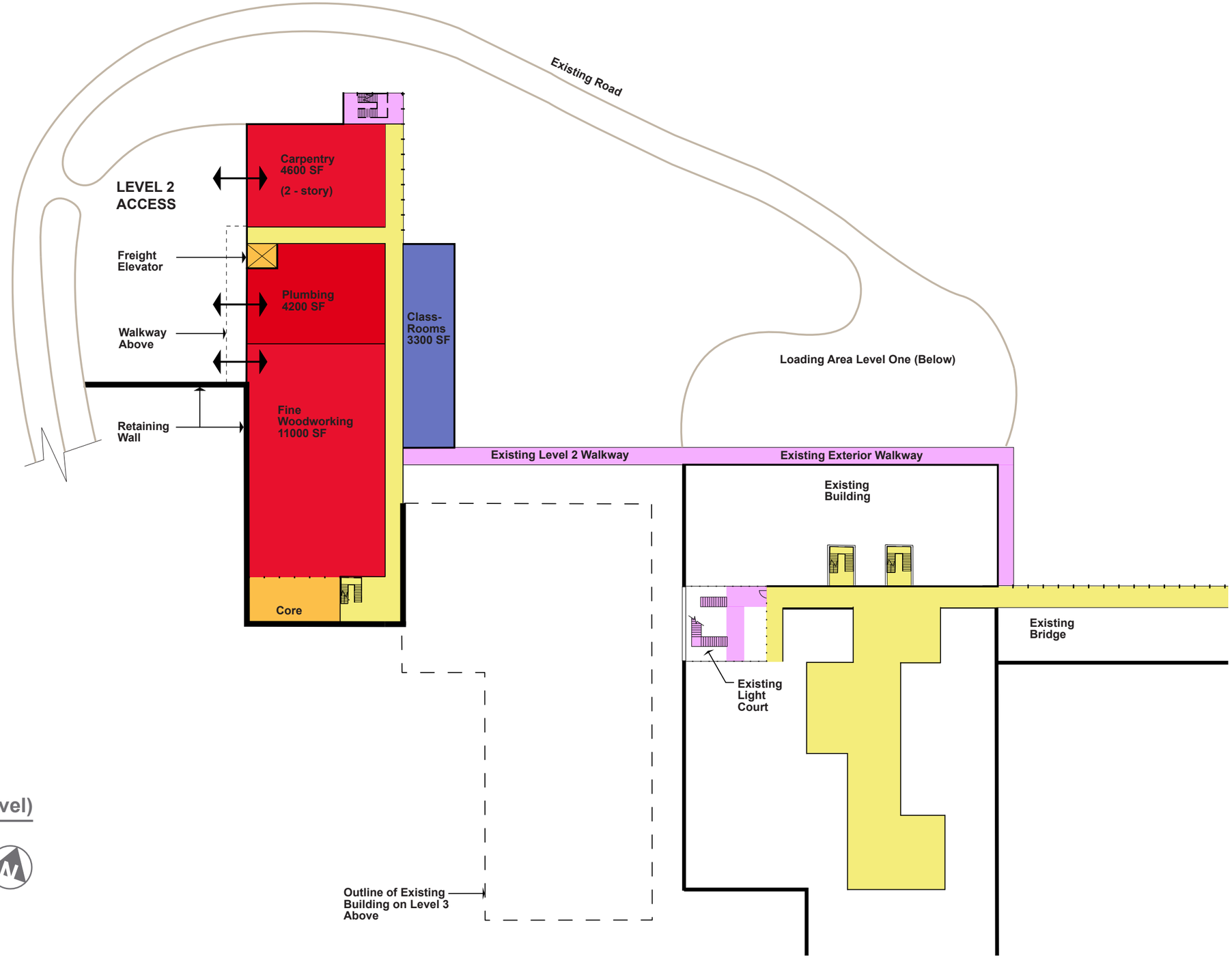


Plan Diagram • Site Plan Diagram

0 50 100 200

Project Description

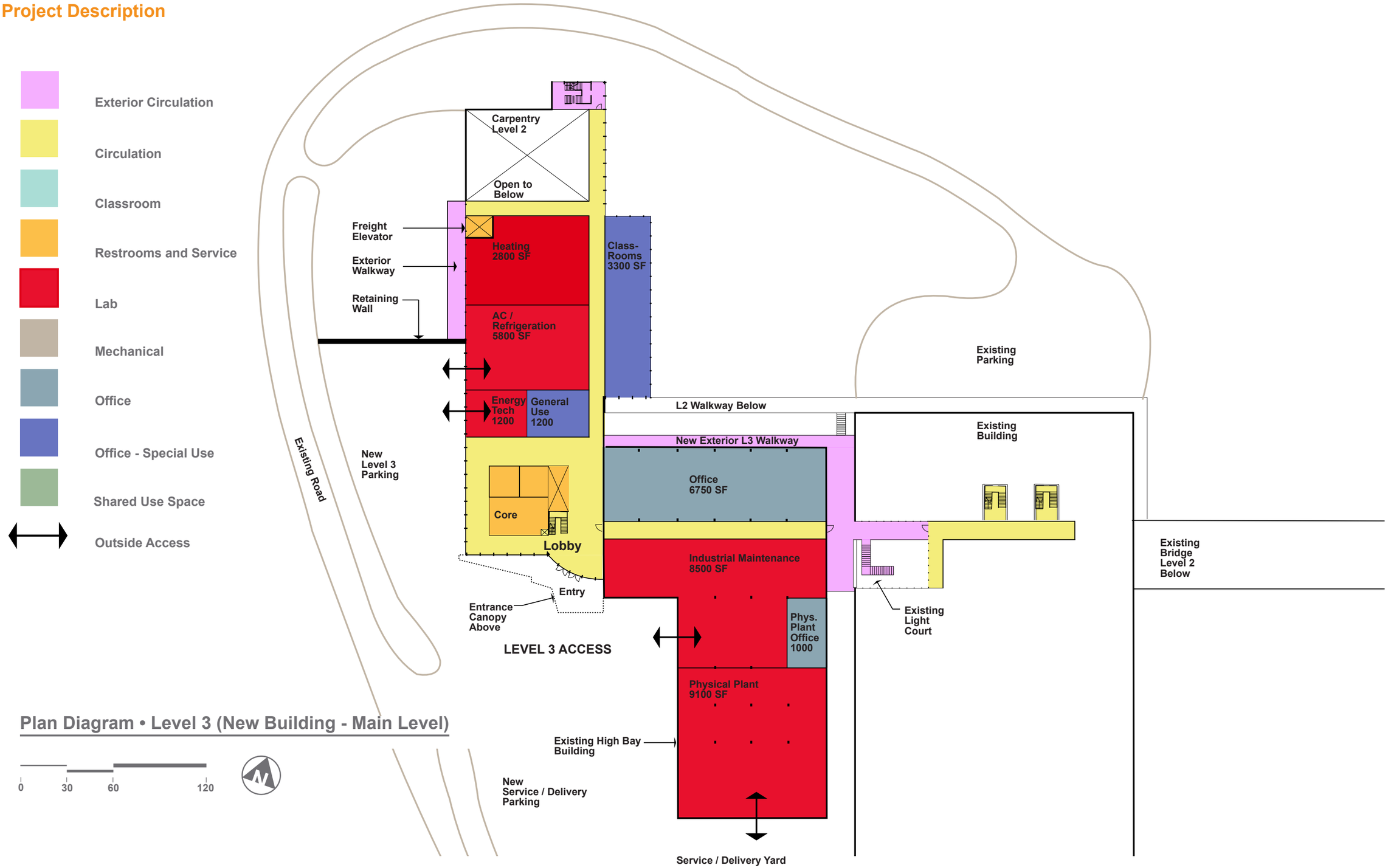
- Exterior Circulation
- Circulation
- Classroom
- Restrooms and Service
- Lab
- Mechanical
- Office
- Office - Special Use
- Shared Use Space
- Outside Access



Plan Diagram • Level 2 (Main Level)

0 30 60 120

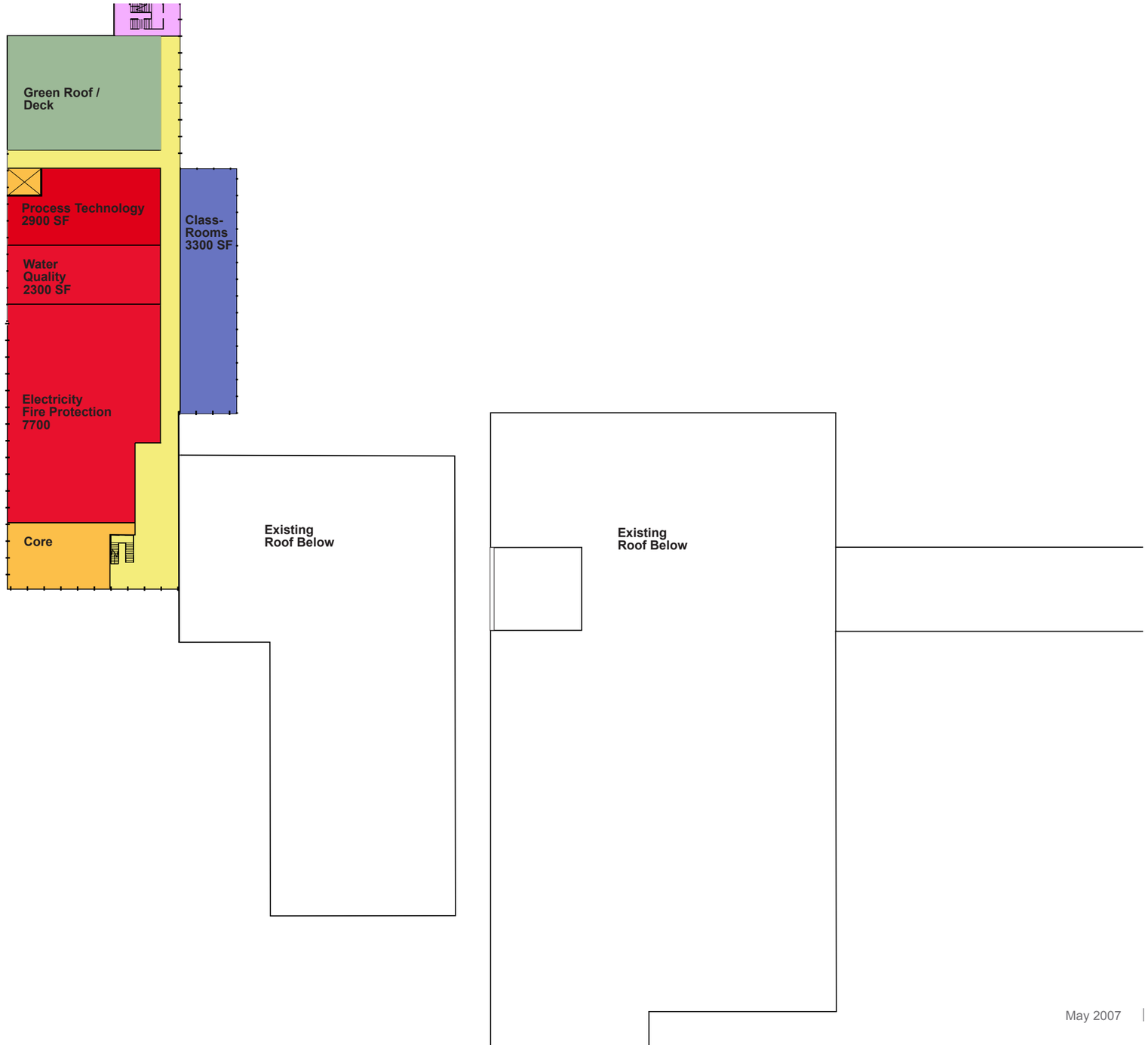
Project Description



Plan Diagram • Level 3 (New Building - Main Level)

Project Description

- Exterior Circulation
- Circulation
- Classroom
- Restrooms and Service
- Lab
- Mechanical
- Office
- Office - Special Use
- Shared Use Space

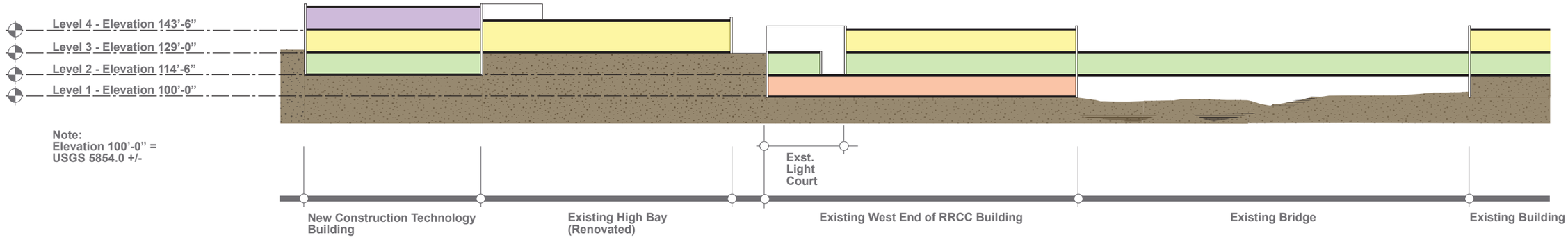


Plan Diagram • Level 4 (Upper Level)

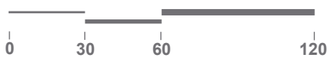
0 30 60 120

Project Description

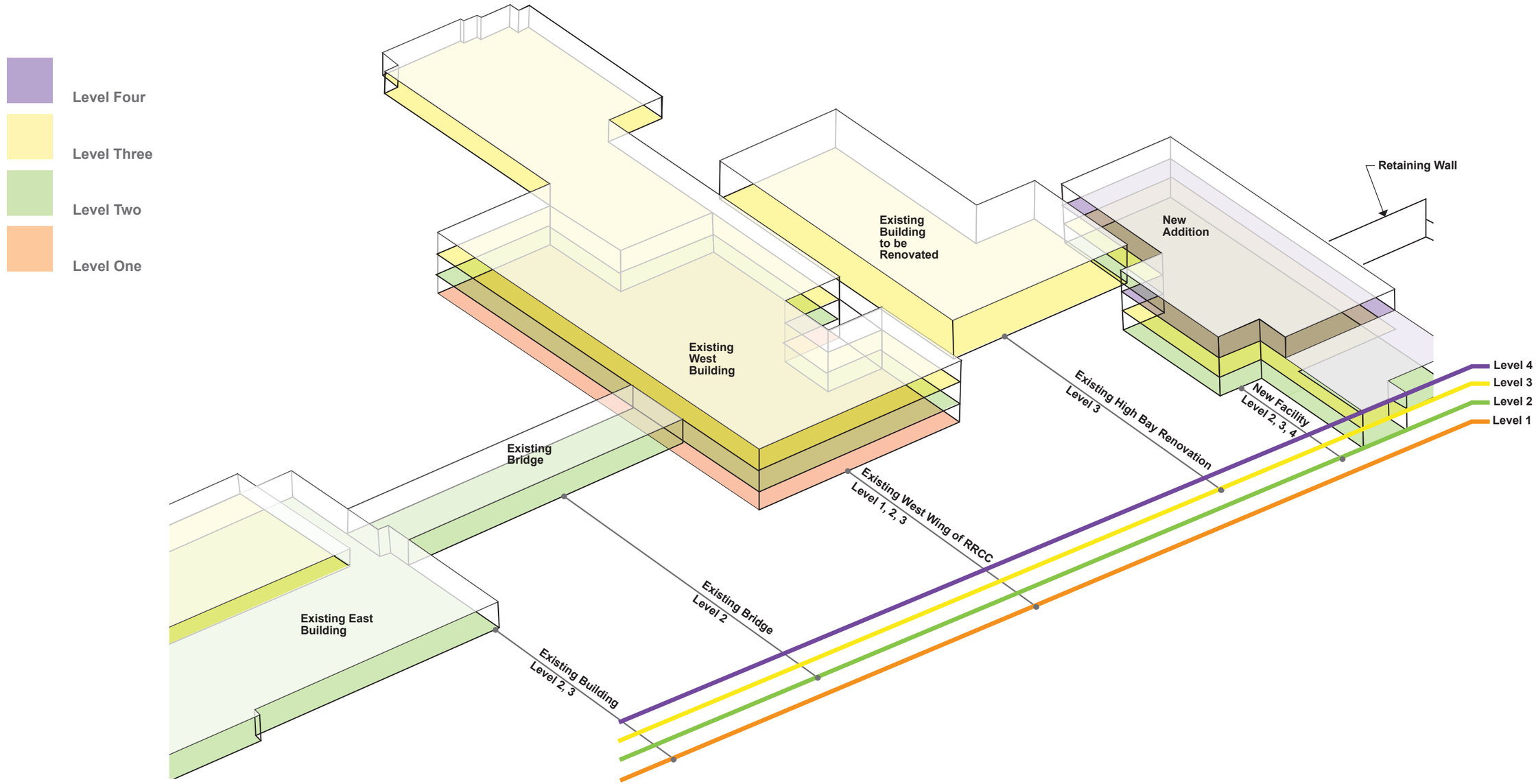
Level Four:	Upper Level - New Building		
Level Three:	Middle Level - New Building;	Existing Construction Technology Building	
Level Two:	Lower Level - New Building;	Existing Bridge	
Level One:	Existing Building Only		



Section Diagram • (Looking North)



Project Description



Three Dimensional Diagram • Floor Levels

Not To Scale

4.3 Project Cost Estimate

		Budget
A. Land Acquisition		
(1) Land Purchase Cost		
B. Professional Services		
(1) Master Plan/FPP		
(2) Site Surveys, Investigations Reports	$	50,000
(3) Architectural/Engineering/Basic Services Phases	$	2,800,000
(4) Code Review/Inspection	$	50,000
(5) Construction Management		
(6) Advertisements, Etc.		
(7) Other (Project Admin & Testing)	$	100,000
(8) Total Professional Services	$	3,000,000
C. Construction		
(1) Infrastructure	$	1,463,533
(a) Services/Utilities		
(b) Site Improvements		
SUBTOTAL - SITE DEVELOPMENT	$	1,463,533
(2) Structure/Systems/Components		
(a) New Building		
1.10 FOUNDATIONS	$	877,500
1.15 STRUCTURE	$	6,013,800
1.20 EXTERIOR ENVELOPE	$	3,253,500
1.25 INTERIOR FINISHES	$	1,926,500
1.30 SPECIALTIES, EQUIP	$	80,900
1.35 SPECIAL & CONVEYING	$	388,000
1.40 MECHANICAL	$	5,698,200
1.45 ELECTRICAL	$	4,315,000
1.50 TELECOMM INFRASTRUCTURE		above
SUBTOTAL - NEW BUILDING	$	22,553,400
(b) Renovate Existing Building		
2.20 DEMOLOTION	$	374,750
2.25 INTERIOR FINISHES	$	2,082,223
2.30 SPECIALTIES, EQUIP	$	22,875
2.40 MECHANICAL	$	2,184,471
2.45 ELECTRICAL	$	1,927,653
2.50 TELECOMM INFRASTRUCTURE		above
SUBTOTAL - EXISTING BUILDING	$	6,591,972
(3) Other (Landscaping)	$	150,000
(4) Total Construction Costs (1thru3)	$	30,758,905
D. Equip. and Furnishings		
(1) Equipment	$	2,900,000
(2) Furnishings	$	400,000
(3) Communications	$	400,000
(4) Total Equip. and Furnishings Cost (1-3)	$	3,700,000
SUBTOTAL D	$	34,458,905
E. Miscellaneous ( )		
Costs	$	307,589
(2) Relocation Costs	$	225,000
(3) Total Misc. Costs (1-2)	$	532,589
TOTAL PROJECT COST	$	37,991,494
F. Project Contingency*		
(1) 5% for New	$	1,569,976
(2) 10% for Renovation	$	659,197
(3) Total Contingency	$	2,229,173
G. Total [A(1)+B(8)+C(4)+D(4)+E(3)+F(3)]	**$**	**40,220,667**

Project Description

4.4 Financial Analysis

Red Rocks Community College is attempting to raise through private donations $10,000,000, twenty-five percent of the total project cost. The remainder of the funding will be Capital Construction Appropriation.

4.5 Project Schedule

The following schedule is proposed:

CCHE Program Plan Approval
July 2007

Legislative Approval
May 2008

Architect Selection
June 2008

Design Start
July 2008

CM/GC Selection
August 2008

Construction Start
June 2009

Phase 1 Construction Completion
August 2010 (New)

Phase 2 Construction Completion
May 2011 (Renovation)

5.0 Relation to the Master Plan

The Red Rocks Community College Facilities Master Plan of May 2001 documents that given a student enrollment projection of 2,782 full-term equivalent (FTE) by the target year of 2013, the Lakewood Campus would require an additional 166,400 assignable square feet (ASF) over the existing space on campus. A substantial portion of the overall space needs analysis deficit is within teaching laboratories for Construction Technology.

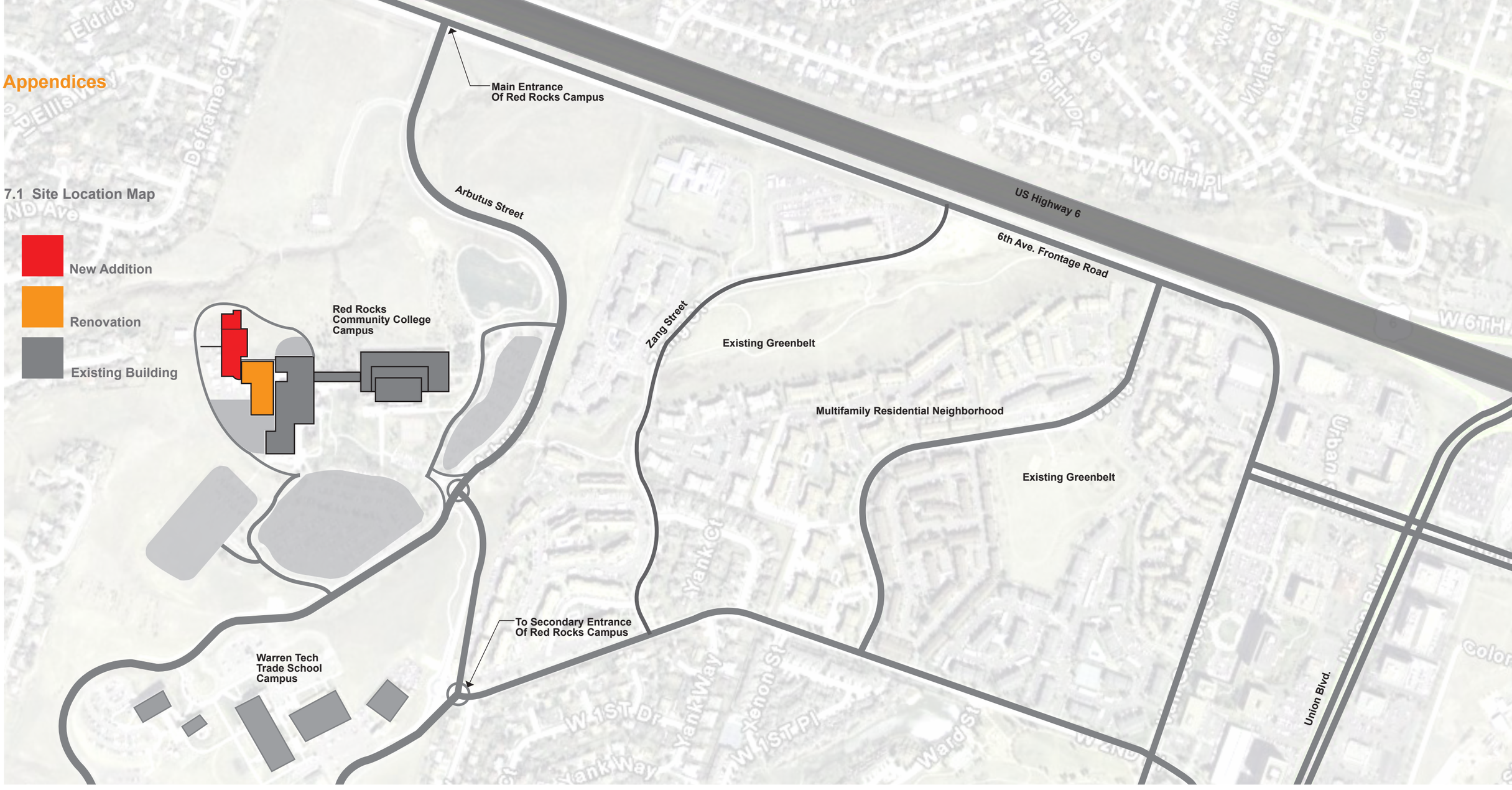
The Construction Technology program required 48,000 ASF of laboratory space at the master plan level analysis. The Facilities Master Plan also identified 19,600 ASF of space within temporary facilities that need to be replaced. The total is 67,600 ASF of need at the master plan level. Therefore, this program plan is in support of the Facilities Master Plan.

6.0 Facilities Alternatives

Our employer partners are relying upon the college to not only prepare new workers but to ensure the continual training of their incumbent workforce. To remain competitive, employers must ensure their workforce is current with the rapidly changing technology found in today's energy manufacturing and construction industries. This growth opportunity is going largely untapped as Red Rocks Community College lacks the physical space to respond to this emerging demand. The Construction Technology program is already experiencing significant loss of more than seventy FTE per year as a direct result of severely curtailing the carpentry program due to space limitations. Fine Woodworking will remain stagnant as we have reached the limit in terms of course offerings and class size again directly due to the lack of space to accommodate new growth.

As the academic programs have grown, additional space needs have been (inadequately) accommodated by adding temporary classroom buildings at the West end of the Lakewood campus, renovating warehouse space at the Arvada campus, and using space in the existing Environmental Training Center along with an additional temporary building at this remote facility on the Lakewood campus. All such space that has been located has now been occupied. The use of this disconnected space in three locations has reinforced the need for contiguous space in order to effectively administer these programs.

7.1 Site Location Map



Plan Diagram • Vicinity Plan

0 200 400 800

Appendices

7.2 Space Requirement Detail

Red Rocks Community College • Program Plan

Space Needs - April 2007

Ref. No.	Functional Area	No. of Ocucpants	ASF per Occupant	ASF per Space	No. of Spaces	Total ASF	TOTAL AREA
	Classrooms & Classroom Service • RUC 100s						
	General Use						**0**
100.00	Classroom • 24-Station	0	0	0	0	0	
101.00	Classroom • 30-Station	0	0	0	0	0	
102.00	Classroom Service			0	0	0	
	Teaching/Open/Research Laboratories & Laboratory Service • RUC 200s						
	Construction Technology						**7,780**
200.00	Electricity, Fire Protection						
200.01	Residential Electrical Mock-up Laboratory	24	60	1,440	1	1,440	
200.02	Commercial Electrical Mock-up Laboratory	20	60	1,200	1	1,200	
200.03	Programmic Logical Controllers Laboratory	14	60	840	1	840	
200.04	Fire Alarms Laboratory	20	50	1,000	1	1,000	
200.05	Motor Controls Laboratory	20	60	1,200	1	1,200	
200.06	AC/DC Fundamentals Laboratory	20	50	1,000	1	1,000	
	Tool Crib/Materials Storage			100	1	100	
200.10	Tool Crib • 200 ASF	1	200	200	1	200	
200.11	Equipment Storage • 400 ASF	1	400	400	1	400	
200.12	Materials Storage • 400 ASF	1	400	400	1	400	
201.00	Plumbing						**4,140**
201.01	Commercial Plumbing Mock-up Laboratory	12	70	840	1	840	
201.02	Residential Plumbing Mock-up Laboratory	12	70	840	1	840	
201.03	Underground Plumbing Mock-up Laboratory	12	70	840	1	840	
201.04	Backflow Mock-up Laboratory	6	70	420	1	420	
201.10	Tool Crib • 200 ASF	1	200	200	1	200	
201.11	Equipment Storage • 400 ASF	1	400	400	1	400	
201.12	Materials Storage • 600 ASF	1	600	600	1	600	
202.00	Heating						**2,760**
202.01	Heating Laboratory	16	70	1,120	1	1,120	
202.02	Sheet Metal Laboratory	12	70	840	1	840	
202.03	Welding/Braising Laboratory	8	50	400	1	400	
202.10	Tool Crib • 100 ASF	1	100	100	1	100	
202.11	Equipment Storage • 100 ASF	1	100	100	1	100	
202.12	Materials Storage • 200 ASF	1	200	200	1	200	
203.00	Air Conditioning/Refrigeration						**5,850**
203.01	Building Automation Laboratory	14	50	700	1	700	
203.02	Controls Room	14	70	980	1	980	
203.03	Commercial Kitchen Laboratory	14	110	1,540	1	1,540	
203.04	Heavy Commercial Refrigeration Laboratory	14	145	2,030	1	2,030	
203.10	Tool Crib • 200 ASF	1	200	200	1	200	
203.11	Equipment Storage • 200 ASF	1	200	200	1	200	
203.12	Materials Storage • 200 ASF	1	200	200	1	200	
204.00	Energy Technology						**1,160**
204.01	Renewable Technology Laboratory	24	40	960	1	960	
204.10	Tool Crib/Materials/Equipment Storage • 200 ASF	1	200	200	1	200	
204.11	Exterior Secure Workspace with Lighting (adjacent to building)						
205.00	Carpentry						**4,600**
205.01	Residential Mock-up Laboratory	24	150	3,600	1	3,600	
205.10	Tool Crib • 200 ASF	1	200	200	1	200	
205.11	Equipment Storage • 200 ASF	1	200	200	1	200	
205.12	Materials Storage • 600 ASF	1	600	600	1	600	

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Appendices

Red Rocks Community College • Program Plan

Space Needs - April 2007

Ref. No.	Functional Area	No. of Ocucpants	ASF per Occupant	ASF per Space	No. of Spaces	Total ASF	TOTAL AREA
206.00	Fine Woodworking & Applied Arts						**11,025**
206.01	CNA Computer Laboratory	8	30	240	1	240	
206.02	Workstations • Hand Tool Area	16	80	1,280	1	1,280	
206.03	Workstations • Woodworking/Carving	16	60	960	1	960	
206.10	Floor Tool Area						
206.11	Lathes			20	29	580	
206.12	Table Saws			140	5	700	
206.13	Band Saws			40	7	280	
206.14	Jointers			40	10	400	
206.15	Thickness Planers			40	7	280	
206.16	Mortisers			15	3	45	
206.17	Sanders			60	6	360	
206.18	Other Stationary Tools			600	1	600	
206.19	CNA Equipment			80	6	480	
206.20	Finishing Area Laboratory	16	50	800	1	800	
206.27	Finishing Area Demonstration	16	20	320	1	320	
206.21	Paint Booth			400	1	400	
206.22	Environmentally Controlled Room			200	1	200	
206.23	Individual's Project Storage	200	10	2,000	1	2,000	
206.24	Tool Crib • 400 ASF	1	400	400	1	400	
206.25	Equipment Storage • 200 ASF	1	200	200	1	200	
206.26	Materials Storage • 500 ASF	1	500	500	1	500	
	Industrial Science and Operations						
207.00	Process Technology						**2,900**
207.01	Process Technology Laboratory	16	100	1,600	1	1,600	
207.02	Operation Control Room	16	25	400	1	400	
207.10	Tool Crib • 100 ASF	1	100	100	1	100	
207.12	Materials Storage • 600 ASF	1	600	600	1	600	
207.13	Display Area	1	200	200	1	200	
208.00	Industrial Maintenance						**8,560**
208.01	Motor Controls Laboratory (within Rotating Equipment Lab)	0	0	0	0	0	
208.02	Programmic Logical Controllers Laboratory (within Rotating Equip	0	0	0	0	0	
208.04	Fluid Powers Laboratory (within Rotating Equipment Lab)	0	0	0	0	0	
208.03	Rotating Equipment Laboratory	16	60	960	1	960	
208.03b	Rotating Equipment Laboratory	16	60	960	1	960	
207.12	Materials Storage • 1,000 ASF	1	1,000	1,000	1	1,000	
212.01	Pipe Fitting and Welding Laboratory	24	60	1,440	1	1,440	
213.01	Dedicated Equipment Laboratory	1		2,400	1	2,400	
211.00	Machine Shop						
206.03	Workstations • Heavy Duty/Machining	16	60	960	1	960	
211.01	Lathes			20	3	60	
211.02	Milling Machine			60	4	240	
211.04	Materials Storage • 200 ASF	1	200	200	1	200	
211.05	Tool Crib • 100 ASF	1	100	100	1	100	
211.06	Individual's Project Storage	24	10	240	1	240	
209.00	Water Quality Management						**2,320**
209.01	Water Chemistry Analysis Laboratory	16	60	960	1	960	
209.02	Pilot Water Treatm't/Waste Water Treatm't Laboratory	16	60	960	1	960	
207.12	Materials Storage • 400 ASF	1	400	400	1	400	
	General Use						**1,200**
250.00	Tutoring/Study Area	16	30	480	1	480	
251.00	Computer Laboratory	24	30	720	1	720	

continued next page

Appendices

Red Rocks Community College • Program Plan

Space Needs - April 2007

Ref. No.	Functional Area	No. of Ocucpants	ASF per Occupant	ASF per Space	No. of Spaces	Total ASF	TOTAL AREA
	Offices & Office Service • RUC 300s						
	Construction Technology						**1,260**
	Existing Staff						
300.01	Chair (Faculty) • 140 ASF	1	140	140	1	140	
300.02	Faculty • 140 ASF	1	140	140	4	560	
300.03	Faculty Adjunct			280	1	280	
	Target Year Staff						
300.50	TY Faculty • 140 ASF	1	140	140	2	280	
300.51	Faculty Adjunct (accounted for under Existing Staff space allocation)	0	0	0	0	0	
	Fine Woodworking & Applied Arts						**760**
	Existing Staff						
302.01	Faculty • 140 ASF	1	140	140	1	140	
300.04	Technical	1	100	100	2	200	
302.02	Faculty Adjunct			280	1	280	
	Target Year Staff						
300.50	TY Faculty • 140 ASF	1	140	140	1	140	
300.51	Faculty Adjunct (accounted for under Existing Staff space allocation)	0	0	0	0	0	
	Industrial Science and Operations						**2,150**
	Existing Staff						
301.01	Program Coordinator	1	140	140	1	140	
301.02	Faculty • 140 ASF	1	140	140	2	280	
301.03	Faculty Adjunct			280	1	280	
	Target Year Staff						
301.51	Faculty • 140 ASF	1	140	140	3	420	
301.52	Faculty Adjunct (accounted for under Existing Staff space allocation)	0	0	0	0	0	
	Shared Use Spaces						
350.01	Administrative Assistant	1	100	100	1	100	
350.02	Reception Area	4	25	100	1	100	
350.03	Workroom • 150 ASF	1	150	150	1	150	
350.04	Conference Room • 16-Person	16	30	480	1	480	
350.05	File Room • 100 ASF	1	100	100	2	200	
	Special Use Facilities • RUC 500s						
	Construction Technology						**5,412**
500.04	Demonstration Classroom • 20-Station	20	25	500	4	2,000	
500.01	Demonstration Classroom • 24-Station	24	25	600	4	2,400	
500.02	Demonstration Classroom • 40-Station	40	22	880	1	880	
500.03	Demonstration Classroom Service			132	1	132	
	Fine Woodworking & Applied Arts						**2,050**
502.01	Demonstration Classroom • 20-Station	20	25	500	4	2,000	
500.03	Demonstration Classroom Service			50	1	50	
	Industrial Science and Operations						**2,460**
501.01	Demonstration Classroom • 24-Station	24	25	600	4	2,400	
501.03	Demonstration Classroom Service			60	1	60	
	General Use Facilities • RUC 600s						
	General Use						**1,500**
600.00	Arrival Space			800	1	800	
601.00	Community Space	30	15	450	1	450	
602.00	Vending/Self-service Area			250	1	250	
	Support Facilities • RUC 700s						
700.00	Locker Room			300	2	600	**600**
701.00	Loading Dock (provided as component of Physical Plant space)					0	**0**
702.00	Short-term Dock Storage (provided as component of Physical Plant space)					0	**0**
703.00	Recycling/Trash Area			200	1	200	**200**
704.00	Hazardous Materials Storage			100	1	100	**100**
706.00	IT Closets			30	6	180	**180**
						TOTAL ASF	**68,967**

Appendices

Red Rocks Community College • Program Plan
Space Needs • April 2007

Functional Area	Occupants	ASF/Occupant	Total ASF
Offices and Office Service			2,300
Administration	2	100	200
Reception	4	25	100
Director	1	160	160
Conference	8	30	240
Staff Group Office	10	60	600
Key/Lock Shop/Office	1	250	250
Mailroom/Office	2	200	400
Plans/Files	1	250	250
Storage	1	100	100
Shops			8,500
Receiving	1	1,500	1,500
Maintenance	5	1,000	5,000
Storage	1	2,000	2,000

Employment Options for Graduates of Red Rocks Community College

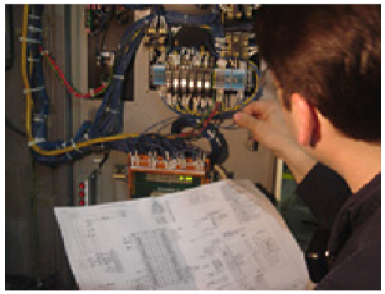
Red Rocks' Programs: Industrial Science and Operations
Construction Technology

The President's High Growth Job Training Initiative

This Presidential initiative is a strategic effort to prepare workers to take advantage of new and increasing job opportunities in high growth, high demand and economically vital sectors of the American economy. Fields like construction, energy, and advanced manufacturing have jobs and solid career paths left untaken due to a lack of people qualified to fill them. The High Growth Job Training Initiative targets worker training and career development resources toward helping workers gain the skills they need to build successful careers in these and other growing industries.

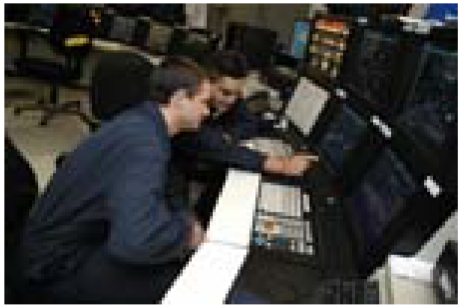
(Source: U.S. Department of Labor Employment & Training Administration)

Fields like construction, energy, and advanced manufacturing have jobs and solid career paths left untaken due to a lack of people qualified to fill them.



Industrial Engineering Technician

Natural Gas Plant—Rifle Colorado



Process Operators – Suncor Energy, Commerce City

Employment Options for Graduates of Red Rocks Community College

Red Rocks' Programs: Industrial Science and Operations Construction Technology

High Growth Industry	Industry Snapshot Source: http://www.doleta.gov/BRG/JobTrainInitiative/	Skills (Source: Manufacturing Skill Standards Council, High Performance Manufacturing, McGraw Hill, 2006	Demand in Colorado (Source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections; Colorado Department of Labor and Employment, Labor Market Information)
Energy	The Energy Industry incorporates a broad range of sectors, including: Petroleum and Natural Gas extraction, refining, and distribution; Electric Power Generation, distribution and Mining. Public utilities employed about 600,000 workers in 2002. Electric power generation, transmission, and distribution provided almost three in four jobs (436,000), while natural gas distribution (116,000) and other systems (48,000) provided the rest of the jobs (U.S Bureau of Labor Statistics) The Gross Domestic Product (GDP) for the energy industry, including electric and gas utilities, nuclear power generation, mining (including coal and minerals), and oil and gas extraction in 2003 was $352 billion, a 3.2% share of the national total. (U.S. Bureau of Economic Analysis)	Entry-level positions, such as engineering technician, usually require at least a 2-year Associate degree in engineering technology. Candidates with strong mathematics and science skills are preferred. College-level courses or prior experience in a mechanical or technical job may be helpful. With computers now used to keep records, generate reports, and track maintenance, employers are increasingly requiring computer proficiency. The increasing sophistication of equipment and machinery requires a higher level of technical skill beyond high school.	Electrician 2002: 11,540 / 2012: 13,460 / AVG Wage: $35.63 Computer Support Specialist 2002: 11.450 / 2012: 15,330 / AVG Wage: $21.80 Production and Operations Workers 2002: 9160 / 2012: 11,100 / AVG Wage: $22.31

High Growth Industry	Industry Snapshot Source: http://www.doleta.gov/BRG/JobTrainInitiative/	Skills *(Source: Manufacturing Skill Standards Council, High Performance Manufacturing, McGraw Hill, 2006*	Demand in Colorado *(Source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections; Colorado Department of Labor and Employment, Labor Market Information)*
Advanced Manufact-uring	The manufacturing sector continues to account for 14% of U.S. GDP and 11% of total U.S. employment. Moreover, manufacturing firms fund 60% of the $193 billion that the U.S. private sector invests annually in research and development. (U.S. Department of Commerce) Manufacturing salaries and benefits average $54,000, higher than the average for the total private sector. Two factors in particular attract workers to manufacturing: higher pay and benefits, and opportunities for advanced education and training. (National Association of Manufacturers) A 2003 survey of U.S. manufacturing employers found that 80% of respondents said that they had a serious problem finding qualified candidates for the highly technical world of modern manufacturing. (National Association of Manufacturers)	Production workers set up, operate, and improve the manufacturing processes and schedules. Process Development workers develop, implement, and improve the manufacturing process. Quality Assurance workers ensure that the manufacturing system meets quality requirements as defined by the business and customers. Health, Safety, and Environmental Assurance workers ensure that the manufacturing system meets HS&E requirements. Maintenance, Installation, and Repair workers tend to the equipment on the manufacturing floor. Logistics and Inventory Control workers plan and control the movement and storage of materials and products in the manufacturing system.	Industrial Eng. Technician 2002 1,030 / 2012 1,230 / AVG Wage $22.32 Industrial Machine Mechanic 2002 2,030 / 2012 2,450 / AVG Wage $20.40 Maintenance Workers 2002 710 / 2012 820 / AVG Wage $15.92

High Growth Industry	Industry Snapshot Source: http://www.doleta.gov/BRG/JobTrainInitiative/	Skills (Source: Manufacturing Skill Standards Council, High Performance Manufacturing, McGraw Hill, 2006	Demand in Colorado (Source: Bureau of Labor Statistics, Office of Occupational Statistics and Employment Projections; Colorado Department of Labor and Employment, Labor Market Information)
Construct-ion	The construction industry is predicted to add approximately 1 million new jobs between 2002 and 2012, an increase of 15%. (U.S. Bureau of Labor Statistics) With total employment expected to reach 7.8 million by 2012, the construction industry is predicted to be among the economy's top 10 largest sources of job growth. (U.S. Bureau of Labor Statistics) Construction has a very large number of self-employed workers. Opportunities for workers to form their own firms are better in construction than in many other industries. (U.S. Bureau of Labor Statistics) Projected employment growth between 2002 and 2012 is substantial for a wide range of construction-related occupations, such as: Electricians: 154,000 new jobs Carpenters: 122,000 new jobs Construction managers: 47,000 new jobs (U.S. Bureau of Labor Statistics)	Those who enter construction from technical or vocational schools progress at a somewhat faster pace because they already have had courses such as mathematics, mechanical drawing, and woodworking. Most skilled craft jobs require profi ciency in reading and mathematics, while safety training is required for most jobs. **"Skills to Build America's Future"** The Skills to Build America's Future Initiative is designed to build national awareness of the importance of skilled workers to our economy and nation and send the message that careers in the skilled trades are plentiful, lucrative, and fulfilling. Launched on April 6, 2004, this initiative is led by the U.S. Department of Labor in partnership with the U.S. Department of Education, the Construction Industry Round Table, the National Association of Home Builders, and the National Heavy & Highway Alliance and its affiliated unions.	Plumber Pipefitters 2002 1,910 / 2012 2340 / AVG Wage $21.26 HVAC Mechanics 2002 4980 / 2012 6230 / AVG Wage $18.78 Carpenters 2002 2,770 / 2012 3,660 / AVG Wage $13.94 Construction Supervisors 2002 9,420 / 2012 11.110 / AVG Wage $25.60

Lab Unit Processes and Supported Industries

The Lab Unit Processes have been designed by the Industrial Science and Operations Employer Partners. Process plant fundamentals found with each of the proposed unit processes will be applicable across several industries

Industry Sector	Food and Beverage	Oil and Gas Production	Petroleum Product Manufacturing	Power Generation	Waste Water Treatment
Companies	Molson Coors	Shell, BP, Encana, Halliburton. Kinder-Morgan	Suncor, Shell	Xcel Energy, Platte River Power	Denver Metro: Molson-Coors
DTU- 1 Bench top Distillation Bench Scale Distillation unit using an external cooling unit, electric heating for a two component distillation.	✓	✓	✓	✓	✓
Plant A Fluid Handling A process control trainer designed to provide instruction in flow control, temperature control, level control, controller modes, heat exchange, field instruments, and troubleshooting. Distilled water is routed through various control loops.	✓	✓	✓	✓	✓
Plant B De-ionized Water Production A water purification unit that uses a demineralization train to produce deionized water. The unit uses online pH and conductivity analyzers to indicate when the ion exchange beds need to be regenerated. Instruction includes principles of ion exchange, the operation of a demineralizer train including backwashing, regeneration, and rinsing, and troubleshooting. This unit can be used to supply the makeup water for Unit A and Unit C (Steam Generation).	✓	✓	✓	✓	✓
Plant C Steam Production and Handling An electrically heated low pressure steam boiler to produce steam from De-ionized water. The unit will supply a network of steam piping and heating devices to illustrate proper steam and condensate handling and management.	✓	✓	✓	✓	✓
Plant D Vacuum Distillation A vacuum distillation unit which separates glycol and water. The distillation tower is heated with a thermal-siphon reboiler which is supplied steam from a boiler. The vacuum is provided by a reciprocating vacuum pump. The process streams are analyzed using a refractometer. Instruction includes principles of distillation, normal operation of a distillation tower, how changes in variables such as reflux flow, tower pressure, and bottoms temperature affect the process, and troubleshooting.			✓		✓

Industry Sector	Food and Beverage	Oil and Gas Production	Petroleum Product Manufacturing	Power Generation	Waste Water Treatment
Companies	Molson Coors	Shell, BP, Encana, Halliburton. Kinder-Morgan	Suncor, Shell	Xcel Energy, Platte River Power	Denver Metro: Molson-Coors
Plant E Waste Water Treatment A waste treatment unit for teaching the basics of pH control and also serving as a neutralizing plant to treat the acidic or basic waste from the other plants. Online pH analyzers are used to monitor pH. Instruction includes how changes in feed flow rate, control at various pH settings, and changes in feed concentrations affect pH control and troubleshooting. Waste water from each of the other Lab units can be routed through this unit prior to discharge to the building drains.	✔	✔	✔	✔	✔
Sample Lab Area Bench lab equipped to support the quality control requirement for each of the	✔	✔	✔	✔	✔
Developmental Plant Area This is space and facilities support for new, innovative process developed by Colorado School of Mines that are to operated and maintained by Red Rocks Community College ISOD and Pre-engineering students.		✔	✔	✔	✔
Industrial Equipment Maintenance Lab This is space and facilities to support the practice of light industrial equipment overhaul and refurbishment. The lab should be equipped with overhead lifting equipment, heavy work tables, machining equipment and compressed air.	✔	✔	✔	✔	✔