The Winding Road To Career Success

Achieving Upward Mobility Through Career Progression Lattices

WORKFORCE SOLUTIONS HEART OF TEXAS
Linking Jobseekers and Employers

C4EO CENTER FOR EMPLOYABILITY OUTCOMES

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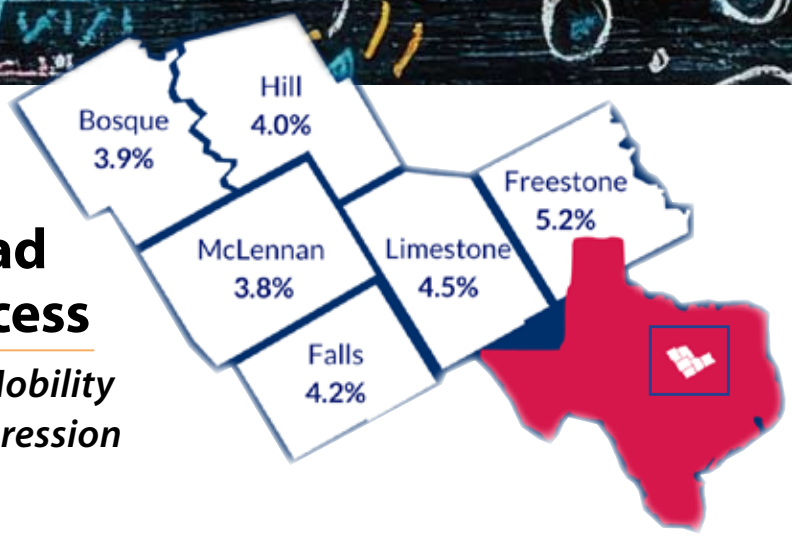

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Acknowledgments

The Workforce Solutions Heart of Texas knows that the key to regional economic success is a well-functioning, appropriately skilled workforce. More importantly, as the economy evolves the labor force must change and grow with it. That means supporting skill training aligned with the needs of the regional business community. It also includes career guidance and providing opportunity to individuals to help them make data-informed education and career choices. In particular Anthony Billings, Executive Director of Workforce Solutions Heart of Texas provided tremendous vision and unwavering commitment to make this project possible. Through his many years leading workforce development efforts in the region, Anthony was the first to acknowledge that to make the lives of his customers better he had to implement programs and policies that 'meet them where they are' by understanding their unique needs, barriers, and challenges. The Career Progression Lattice project was envisioned to demonstrate the potential for upward career mobility – especially for people who cannot otherwise imagine personal career success. Additional thanks to Erin Dosher, Eunice Fernandez, and Linda Stanford for project management and invaluable review and comment.

This project reflected the many dynamics at play in the labor market. The COVID recession is well behind us, and the Texas and Waco regional economy has experienced strong output and job growth. With persistent post-COVID labor shortages, the business community is moving toward increased skill-based hiring, expanding the available labor pool to embrace more of those with the skills and willingness to work. By the close of this project the job market has started to cool down, making jobs less plentiful but still leaving employers with labor shortages, elevated wages, and the need for more workforce training.

This project was fortunate to benefit from the capabilities and labors of many talented and dedicated individuals. The unsung hero of this project is John Romanek, a database guru with unparalleled intellectual labor market expertise and curiosity to match. This project is our first test using large language modelling to identify skill-based occupational similarity. John automated a cosine similarity matrix method which was applied to SkillsEngine detailed work activities and sub-knowledges; an endeavor that many considered beyond the resources of this project. Countless hours of research and data manipulation later, John made our vision a data reality. I am privileged to have John as part of our team, and grateful for his many contributions and his friendship.

An important part of this project was deep-dive interviews with regional employers. There is no one better at teasing out employer insights than Mick Normington, who conducted all our interviews. Mick has a curiosity for and interest in how business deals with human resources challenges, what skills they need, and the qualifications they value. His stories from twenty Heart of Texas businesses are truly engaging and insightful. Our thanks also to the business leaders that gave freely of their time and perspectives on recruitment and hiring nuances – valuable intelligence that can't be discerned through statistical analysis alone.

Acknowledgments

A special recognition goes out to Michael Bettersworth, Chief Marketing Officer at Texas State Technical College and founder of SkillsEngine. Michael brings unfathomable energy and perspective to everything he does, which includes unprecedented practical innovation and leadership in forming and sustaining SkillsEngine. None of the career lattice work would be possible without his vision, expertise, and grit in building the nation's most robust and practical skill alignment data initiative.

The content in a career lattice is valuable, but the power, relevance, and impact to the consumer comes from effective graphic presentation. Edgar Dale's Cone of Learning gives us a structure that says people are more likely to learn something they can visualize than just by reading alone. We are grateful to have Pun Nio as our creative specialist and graphic design artist. Her ability to visualize, translate, and depict our content into eye-catching and relatable final products is instrumental to our efforts.

We would also note three outside contributors that helped make this project possible. We were well down our methodological journey when we discovered research from the federal ONET team into using advanced large language modeling to assess occupational similarity. Not only did this research validate our approach, but their Career Changers matrix provided contextual guardrails as we built each lattice. Kudos to Pam Frugoli who leads the ONET team providing one of the world's most significant and underfunded occupational resources, and Phil Lewis Senior Technical Officer for his intellectual contributions. Also recognition to Darrell Sandall and John Henderson, a pair of adroit industrial organizational psychologists who hold major responsibility for curating the robust SkillsEngine skills library and the sub-knowledge domain that became an integral part of our methodology.

Finally, reflective of our times, this project took advantage of several generative AI tools to support our analysis and develop unique, descriptive content such as our recruiting job descriptions. We also used AI to validate and refine our core approach and methodology to develop career lattices. As technology improves we believe generative AI will be extremely beneficial to help staff and clients alike better understand the job market.

Project Director and principal investigator Richard Froeschle was responsible for pulling all the pieces together, crafting this final report, and bringing project expectations to reality. Richard is responsible for the scope and content of this report, including the skill-based lattice construct. Any errors of commission or omission in the analysis, synthesis, or presentation of materials herein lie with him.

Introduction

"The only person you are destined to become is the person you decide to be" - Ralph Waldo Emerson, American Poet

Much has been made of the differences between what Baby Boomers and Born Digitals want out of their careers. And while the context and thought process may be different, most workers want the same things from their jobs; a reasonable wage for their efforts and expertise, a desire to do meaningful or impactful work, the opportunity to learn new skills, and the potential for upward career mobility. These top issues have not changed much across generations. But the past decade has witnessed many interrelated phenomena that have complicated the career development process. Many of these issues have added complexity to the relationship between workers and the world of business. They have also contributed to labor shortages, increased job hopping, and become impediments to career mobility.

The COVID pandemic and subsequent economic turmoil challenged the concept of what people call 'normal'. Supply chain backlogs and inflation affected the availability and prices of products and services; many of which remain elevated and have resulted in on-going consumer anxiety.

Perhaps the more important trend was how COVID affected the labor market. Federal and state governments restricted labor force participation for all but essential businesses. Health fears kept many workers from immediately returning to work after restrictions were lifted. This was partly offset by new flexible work arrangements and a work-from-home movement. Many other factors limited labor participation, but none received more attention than the Great Career Reflection. Returning to work took on a new thought process for many employees. COVID-affected workers challenged the wages they expected for certain jobs. Employees demonstrated their willingness to job-hop to earn higher wages or achieve greater upward mobility. And many revisited their values toward work, exploring work - life balance choices, and wage and salary alternatives such as independent gig work and self-employment. Even as the pandemic has waned, many of these considerations remain active. What also persists is that it is increasingly hard to fill jobs and retain workers for roles that are viewed as leading to nowhere.

In addition to the impacts of COVID, labor shortages due to changing demographics are affecting employer access to skilled and unskilled labor. Unemployment rates in Texas were 4.2 percent (seasonally adjusted) in November 2024 and 3.9 percent (unadjusted) in the Heart of Texas region, putting skilled workers in an enviable negotiating position. Federal Reserve data show that job changers not only have had steeper earnings increases over job stayers, but that workers are increasingly concerned with their upward career and wage mobility[1]. This puts added pressure on business as they adjust to rising wage trends, a generational shift in young worker attitudes, and increased competition for labor that many in the Waco area have never experienced before.

[1] Atlanta Federal Reserve Wage Tracker. The differential in earnings between job stayers and job leavers has narrowed significantly from a peak in August 2022.

Helping workers gain marketable skills and helping them visualize[2] future job opportunities is a primary objective of the workforce system. Coincident with serving the population is a requirement to provide business with a skilled workforce through training and supportive services. With these powerful forces dictating the 'why' part of the career lattice equation, what remains is how to best help workers achieve their career aspirations, while providing the business community with the skilled workforce it demands. The career progression lattice framework presented in this initiative is designed to help Workforce Solutions Heart of Texas achieve this dual mandate in a time of market volatility and labor shortage.

> *"Changing industries was relatively rare because it often meant 'starting over' and the loss of a wage premium that traditionally accompanied legacy industry knowledge. Those days are largely gone. Today, rather than a stair-step career ladder, a career progression more often takes place on a 'career lattice'."* McKinsey Consulting

Why Career Progression?

The heart of this project is to communicate the dynamics of career mobility, identify occupational training targets, and illustrate how individuals can leverage their skills over time to generate upward wage mobility. It is in response to the current WIOA Section 108 (Local Plans) to compel local workforce boards to integrate labor market data (e.g., regional and county profiles), employer feedback (e.g., direct employer interviews), and "in-demand" occupation forecasts (e.g., identifying regional Target Occupations) into their education and training programs[3].

This project by Workforce Solutions Heart of Texas is also designed to provide better labor market and career information to guide career decisions of students and workforce participants alike. The approach or the 'how' in this case is based on the fact that traditional career ladders have given way to career lattices. The latter concept represents an uneven and unpredictable journey that can be punctuated by many sources of skill acquisition, lateral movements into related occupations, and even stop outs. Career ladders sound like a promising idea until one realizes that life is seldom linear or consistently upward. A lattice depicts the possibility for upward mobility and personal growth, but also the potential for unrealized career opportunity if learning new skills is not a priority. Each lattice begins with an anchor occupation that represents an occupational starting place. The anchor job meets people where they are, i.e., at the beginning of a career journey. The direction and altitude of that progression will be determined by personal initiative and grit. But the lattice provides a road map that shows where opportunity exists to leverage one's existing skills that can serve as a foundation from which to move forward.

[2]Professor Scott Galloway from NYU notes that humans process visual information about 60,000 times faster than we do words. He cites researchers at MIT estimating that the human brain can correctly identify an image in as little as 13 milliseconds. The lattices are designed to capture the attention of those more likely to embrace pictures than words.

[3]Although the 118th Congress reached general agreement on the language of a new WIOA, they adopted a continuing resolution and adjourned in December without formally reauthorizing WIOA.

So what's behind the increased attention to career progressions? Two major trends are largely responsible;

1) an apparent misalignment between the skills of available workers and regional labor market demand. This, in turn, is affecting wage growth, workplace satisfaction, labor turnover, talent availability, and extended time to hire; and
2) in a full-employment/labor shortage environment, getting a first job in an 'anchor' occupation is not much of a challenge for most people. It is important to remember that a 3.9 percent unemployment rate also translates into a 96.1 percent employment rate e.g., workers that already have a job. Ironically, this also diminishes the need for workforce development intermediaries to place people in jobs. *Thus the primary role of the workforce system has evolved from placing workers into jobs to helping business find skilled workers and helping workers exit the treadmill of endless unskilled jobs into a career progression lattice that offers upward career mobility.*

> *"Being in charge of your work life doesn't mean you always move with assurance and sublime self-confidence; it means you keep moving, continuing on your own path, even when you feel shaky and uncertain."*
>
> Charlotte Beers, author of *I'd Rather Be In Charge: A Legendary Business Leader's Roadmap to Achieving Pride, Power, and Joy at Work*

Consulting firm Lightcast conducted a 2023 National Alumni Career Mobility Survey to 'uncover best practices to transform student career success'. For the fourth consecutive year, the number one "high impact career practice" was 'understanding career opportunities', closely followed by 'creating a plan for my life'. These two observations stem from the finding that about half of survey respondents didn't decide on their career path until after they completed their college degree. The career lattices are designed to address both these issues.

Career Ladders vs. Career Lattices vs. Guided Career Pathways

Growth in the civilian labor force in the U.S. slowed to 0.75 percent annually between 2013 and 2023 (7.5% total). Between 2023 and 2033 the growth rate at 0.37 percent per year (3.7% total) will be less than half that level. Each available worker will be more precious as; (1) large numbers of baby boomers continue their retirement, (2) labor force participation rates for prime-age workers post-pandemic, and female LFPR rates plateau this decade, and (3) there are fewer new entrants due to lower birth rates in the previous generation[4]. This has resulted in a renewed push toward upskilling and reskilling to optimize the available work force. As upskilling becomes more important, the number of approaches to identify and structure upskilling potential become more prevalent. The career progression lattice concept behind this report is one such example.

Guided Pathway: A series of structured, connected education programs and support services that enable students to advance over time to better jobs through the attainment of higher levels of education and training. Primarily used as a means to organize education program offerings.

Career Progression: A mapping of occupational opportunities with potential for upward earnings mobility based on the ability to leverage individual knowledge and skills. Primarily designed to enable individual career development potential through high value skills regardless of formal education credentials.

[4] The dearth of new labor force entrants is one reason the topic of immigrant labor has taken on such a prominent role in the national discourse.

McKinsey consulting conducted a global survey to assess the worker attraction and recruiting potential in the post-Great Resignation period. Among several interesting observations is the number of workers that left a job and found a new job in another industry. Their findings showed that just 35 percent of job leavers over the past two years took a new job in the same industry. Some industries like Consumer/Retail had only 24 percent of job leavers return to the same industry. McKinsey concludes that it is the new skill-based hiring emphasis that is driving this behavior. These findings suggest the further erosion of traditional career ladders and the industry sector-based pathway models that support them. Moreover, the research notes a reduced stigma attached to workers that job hop, have resume gaps, or find career options in different industries.

So, what are the main distinctions between a career pathway and a career progression? Jobs for the Future defines a career pathway as "a sequence of experiences intentionally designed to facilitate the development of academic, technical and employability skills connected to a set of related occupations." It is primarily credential-based and is planned and structured by design to help students traverse the formal educational spectrum. A career progression also has a hierarchy, but movement among career options is not necessarily linear, and does not always require a degree or credential. Skills are acquired in a more stochastic or random way, often based on serendipity, e.g., right place, right time, right circumstance, and personal grit. Rather than promoting 'credentials of value' career progressions are based on learning new 'skills of value' regardless of how or where they are acquired.

> *"Previous research has shown that the "job ladder"—in which workers obtain large pay increases when they switch to better jobs or when firms want to poach them—is important for wage growth".*
>
> Jobs and Careers, ***Liberty Street***

There are several other important distinctions. For those with a job already, responsibility for job change puts career decisions in the hands of the worker, without relying on a company or supervisor. The worker chooses when to take a promotion, pursue additional education or training, or change jobs. It doesn't rely exclusively on an employer to shape their career future. In a career progression not all job changes are upward. Sometimes a move is lateral or downward depending on life circumstances. Stop-outs for education and training, unforeseen life circumstances, or unemployment can take one completely out of the labor market, i.e., off a lattice. Career changes that involve occupational or industry change are no longer unusual. The career lattice model is much more representative of today's work life experience and the skill-based hiring movement. It follows the tenets of the Skill Layering model discussed in Appendix B in which skills can be acquired through various formal means and informal learning.

In practice, very few new labor market entrants have any idea what the job market has in store for them. Some workers are subject to the 'accidental theory of career development' in which their work life is much more reactive than planned. Job changes tend to be more a function of serendipity or happenstance – taking advantage of opportunities as they arise. In this context, phenomena such as business cycles and personal networks, like who you know or meet, can be more important than a career development strategy.

There is no doubt that everyone's career trajectory has some serendipity in it. But good luck, or the absence of good fortune, should not be a substitute for career planning. An October 2024 article in the Economist magazine acknowledged that luck can play a role in career mobility. They pose the question, "if luck does play a more important role in outcomes than is often acknowledged, what does that mean? For individuals it suggests you should increase the possibility that 'chance' will work in your favor" Their answer is to help individuals increase their 'surface area of luck'. This means putting yourself in as many situations as possible (job fairs, internships, industry conferences and trade shows, networking mixers, company recruitment events, etc.) where you won't be rejected. It is a way of giving luck more opportunity to work in your favor".

In July 2022 after the COVID recession, workers who switched jobs experienced on average 8.5 percent wage increases, compared to 5.9 percent for 'job stayers' [5]. This taught workers that the best way to earn more and increase one's 'surface area of luck' was to change jobs. This triggered historically high quit rates. By July 2024 the gap between switchers and stayers was only 0.5 percent as job postings diminished and quit rates returned to pre-pandemic levels.

What is certain and pervasive is that most people begin their work life with a starter set of skills, both technical and behavioral. The question is, how do they build, or even conceptualize, a life-long career progression that provides opportunity for increased earnings and advancement? The skill layering model presented in Appendix B demonstrates that skill acquisition is continuous, non-linear, and occurs across multiple education and workplace settings. Skill development has no defined endpoint and there is no single or universal path of skill acquisition for everyone. Language in the proposed reauthorization of the WIOA legislation intends for Boards to better align training and education services to local workforce needs, emphasizing skill acquisition relevant to in-demand industries and occupations.

So, how does a worker assess and navigate upwardly mobile career opportunities? In other words, what information is available to help a worker conceptualize a lifelong career progression lattice? How do they internalize the reality that their entry level skill set has value and can place them on a personalized career lattice? Most important, how do they make labor market data, like occupational similarities depicted on career progressions, actionable? Do customers understand that movement within and upward on a career lattice will likely be dependent on individual initiative and the acquisition of additional skills and credentials? And, for the education and workforce development community, what training or wrap-around services are provided that support these concepts? The idea behind a skill-based career progression lattice model is that actionable labor market information can be developed and presented in a way that provides decision support for real life career decision-making.

Another way to think about helping people attain upward career mobility is to better align their educational credentials as they progress through the education system (either public or private). Career pathways in this context are designed to better align education course-taking with a student's career objectives and labor market trends. Articulated course work

that spans high school and college can lead to less redundant and costly studies[6]. And, more importantly, lead students to coursework that moves them more quickly and seamlessly toward their career objective. In this approach improved credential alignment should parallel the available job opportunities in the region in which one chooses to live[7].

The term 'guided pathways' is another way to express an aligned series of credentials that are linked to a growth industry sector[8] . In almost every case, a career or guided pathway connotes improved alignment between education and the labor market. There is considerable work currently underway in Texas, especially within the higher education community, to define and operationalize career pathways[9]. In most cases, the term career or guided pathway is used to describe articulated education curricula organized around an employment-centered goal. It often includes the notion of building a portfolio of skills[10]or credentials to help a student prepare to compete for desirable a.k.a. 'good' jobs. Many of these guided pathways are built around stackable credentials that help students build toward credentials with greater labor market value.

But while career pathways are important to the student population, and the organizing of academic content, the workforce development system most often works with dislocated and otherwise unemployed persons trying to earn a living, support a family, and grow their career opportunities. Most workforce participants have concluded their formal education – at least that traditional, linear route with which we are all so familiar. Many of these workers are in entry-level jobs with little knowledge of where to go or what to do next to earn a better living. They are often told that upward mobility is only possible through higher education, much of which is viewed as unattainable to workers who move across secondary labor market jobs trying to make a living.

For these individuals, career progression lattices provide a more realistic reflection of how the job market can work and serves as a roadmap for the future. Each individual starts with an entry level occupation, some of which are higher paying or more prestigious than others. By examining transferable skills and knowledges and leveraging available labor market data, the career progression lattices demonstrate opportunities for personal growth, occupational mobility, wage progression, and offer direction for future education and skill acquisition. They suggest a roadmap of possibilities and a blueprint for hope.

[6]From College to Jobs: Making Sense of Labor Market Returns to Higher Education, Thomas Bailey, The Aspen Institute, 2016, p. 27, *"As a result, [of uninformed course taking] many students do not take optimal paths through college, taking courses that do not count toward their intended degree or, for community college students, taking courses that will not transfer for junior standing in their desired major."*

[7]This is the primary function of the Workforce Board Targeted Occupations list.

[8]There seems to be general agreement that a guided pathway involves whole college reform, including student guidance, and not just course or program articulation. For information about guided pathways at Austin Community College see https://sites.austincc.edu/guidedpathways/

[9]There are many efforts underway in Texas to promote career pathways and encourage students take courses that are grouped together around a career aspiration. HB 5 created five 'endorsements' designed to help students entering high school acquire in-depth knowledge of a subject area of their choosing such as STEM or Arts and Humanities. *Accelerate Texas* is a joint initiative between the Texas Workforce Commission and the Texas Higher Education Coordinating Board to build capacity to expand career pathways in the state. TEA's Programs of Study is another effort to group coursework around a common occupational theme.

[10]The early 2000s witnessed significant efforts to establish and highlight the importance of electronic student portfolios. The resurgence of Electronic Learning Records (ELR) to digitally capture validated learning objectives and skill acquisition builds on prior efforts to establish e-portfolios such as those from Educause Learning Initiative and the Association of American Colleges and Universities.

Internal Career Ladders vs. Career Lattices

A final thought on the topic of upward wage mobility is the differentiation between external career progressions and employer-specific internal career ladders. Individual wage gains happen to people who are already employed and who receive internal promotions with their current employer. Whether through dedicated preparation, skill acquisition, or good fortune many workers experience upward career mobility and wage gains within the same company. *This is one of several excellent reasons why it is important to get that first job, exposing workers to better opportunities while they excel in the job for which they were hired.*

The lattice layouts are two-dimensional depictions of potential upward career and wage mobility. They assume one gets an entry-level job at a company and subsequently practice the knowledge and skills associated with the job title into which they were hired, while they add new skills to move forward in a chosen progression (see Appendix B Skill Layering). **The career lattice depicts movement from occupation to occupation as if each move on the lattice inherently comes with a change in employer. That is not necessarily true!** In fact, many companies have defined internal labor markets in which a person can advance through occupational title change and achieve pay increases within the same company. Most larger companies have a job classification and compensation schema that is responsive to external wage changes and built around job levels and generalized pay factors that dictate internal pay progression.

The concept of job leveling, also known as internal job classification, defines and classifies job responsibilities and work roles and sets compensation parameters, while establishing career pathways that define how individuals can progress within an organization. Job leveling helps companies understand market pay data, build internal career paths, and convey advancement opportunities to employees.

Over the past half-century the practice has morphed into a vehicle that includes setting employee expectations around building careers, achieving upward pay mobility, and determining succession planning policies. Thus, while the lattices depict upward skill-based career mobility, that mobility can come either by rising through the internal workings of the same company (job stayers) or through employer change (job leavers).

An interesting way to think about internal progressions is by adding a third dimension to our two-dimensional lattice. This third dimension can be applied at each stop on a career lattice. Thus at any occupational milestone a worker has an option to gain experience and build their skillset with a single employer or to achieve higher earnings by changing both occupation and employer [11]. While this may not be an option at small and mid-sized companies, career progression can occur within an organization that promotes from within, invests in worker upskilling, and which offers a diverse set of job roles within the organization. This is a key component of Jobs for the Future's (JFF) Quality Jobs Framework which provides the definition of a quality job. Workers are encouraged to discuss career advancement opportunities internally before changing employers.

SAMPLE: Internal Job Classification and Job Leveling					
Job Level	Pay Mid-point	Third Quartile	Overview	Skills / Proficiency	Experience
Level 4: Senior level	$77,064	$87,048	Highest-level support. Performs advanced tasks.	Advanced skill set within role. Leverages skills to establish new techniques.	Typically requires 5+ years of related experience.
Level 3: Mid-level	$70,096	$79,144	Senior-level position. Performs complex tasks.	Fully proficient in role. Applies skills to complete a broad range of tasks.	Typically requires 3+ years of related experience.
Level 2: Intermediate level	$63,752	$72,020	Mid-level position. Performs general tasks and completes routine assignments.	Developing proficiency in role. Applies skills to the completion of assigned tasks.	Typically requires at least 1 year of related experience.
Level 1: Entry level	$42,640	$47,892	Entry-level position. Performs routine tasks as directed.	Acquiring new skills and gaining an understanding of role responsibilities.	Typically requires little to no related experience.

In a labor shortage environment, such as that seen in the post-COVID economy, workers are more inclined to pursue upward career mobility via job hopping than waiting for advancement opportunities with their current employer. As discussed previously, the Atlanta Federal Reserve shows that over the past several years job changers experienced much higher wage gains than those that stayed with their employer. Thus companies that promote 'employer of choice' practices[12] like internal career and wage progression are more likely to buck this trend and retain their workforce.

> *"Skill formation is a life cycle process. It begins in the womb and continues on in the workplace. Education policy is only one aspect of a successful skill formation policy, and not necessarily the most important one."* James Heckman and Dimitriy Masterov (2005)

The major difference between an internal career progression and a career progression lattice is that internal progressions tend to be limited to a single industry sector and function in a more stair-step fashion – much like a career ladder. A career lattice, on the other hand, can cross industry sectors. Plus, it acknowledges that over a lifetime a person might leave the labor force or make irrational economic choices relative to their careers based on life circumstances.

[11]Changing employers but neither occupational title nor work responsibilities is more often referred to a job hopping.

[12]The concepts behind being an employer of choice align with the notions of job quality promoted by Jobs for the Future (JFF). They include practices such as continuously re-recruit your top talent, promote from within whenever possible, treat workers as professionals and assume they have other job options, avoid layoffs, over-communicate with employees, etc.

The Move Toward Skill-based Hiring

It's clear that one can acquire skills in many ways and across multiple workforce experiences. Everyone has skills! But many of the best jobs typically have degree requirements; whether or not successful performance on the job really requires a degree. The so-called 'paper ceiling' limits talented, but non-degreed workers from breaking into many good, primary labor market jobs. The good news is that this pattern is changing. Employers are moving toward skill-based hiring, which recognizes that skills and experience can often outweigh formal education for many jobs. The bad news is that skills-based hiring appears to be moving slower than the rhetoric indicates[13].

So how does skill layering, with an emphasis on alternative approaches to skill acquisition, and the broader move toward skill-based hiring in the business world connect to career progression lattices? Career progression lattices are predicated on the commonality of skills across occupations and jobs. They are not bounded by industry-based frameworks like ONET or academic ladders like higher education guided pathway models[14]. They are designed and executed to leverage worker skills into a path of upward wage mobility. As such, a skill-based lattice is a major shift in thinking about work and workers from a job or credential-based concept to a skill-based concept.

If you're an employer, rather than think about the jobs you post you can focus on the skills and abilities essential to your business and assigned to a given role. If you're a worker, you can focus on the skills and attitudes you bring to the labor force rather than on the jobs you've held. It is a more humanistic view of how workers and work are organized. As Deloitte opines in their 2022 Skills-Based Organizational Survey, "We see the shift to a skills-based organization as the first step of an evolutionary journey to making decisions based on individuals rather than jobs—with the word 'skills' eventually becoming short-hand for more granularly defining workers with an array of skills, interests, passions, motivations, work or cultural styles, location preferences and needs". A skills-based career lattice is an important move toward the workforce system meeting people where they are and setting a path to uplifting their potential.

[13]Sigelman, M., Fuller, J., Martin, A. (February 2024). *Skills-Based Hiring: The Long Road from Pronouncements to Practice.* Published by Burning Glass Institute. In this research the authors note that "For all its fanfare, the increased opportunity promised by skills-based hiring was borne out in not even 1 in 700 hires last year."

[14] See *Report: Guided Pathways Show Progress,* Inside Higher Education, September 14, 2020 at https://www.insidehighered.com/news/2020/09/15/progress-guided-pathways-promising-still-much-do-report-says

Career Progressions: What They Mean for the Heart of Texas

As discussed above, this career progressions project is intended to help Workforce Solutions Heart of Texas staff address several objectives, including those in the proposed WIOA reauthorization act HR 6655 *A Stronger Workforce for America Act*. There are many skill-centric provisions in the proposed language, but none so clear as in section 102 (1) (F) which requires a description of any activities the State is conducting to expand economic opportunity for individuals and reduce barriers to labor market entry by: "(i) developing, in cooperation with employers, education and training providers, and other stakeholders, statewide skills-based initiatives that promote the use of demonstrated skills and competencies as an alternative to the exclusive use of degree attainment as a requirement for employment or advancement in a career." The career progression lattice project fits this description. The lattices visually display potential earnings growth trajectories for workers in entry level jobs. The lattices also clearly illustrate the high correlation between enhanced earnings, skill mastery, and continued formal education, especially showing the potential return on investment for recognized postsecondary credentials[15].

A good plan today is better than a perfect plan tomorrow".

General George S. Patton

The need to increase earnings is a major driver for most career changers, especially in the face of changes in family composition and recent increases in price levels[16] . A good illustration of this concept comes from the Living Wage Calculations developed by Amy Glasmeier at MIT. According to her calculations, in 2024 a single person living in McLennan County (Waco) must make $18.69 an hour ($38,875) to achieve a living wage. However, that wage rises to $31.98 per hour ($66,518) for a single worker with one child, and to $38.46 per hour ($79,997) for a worker with 2 children. It may be trite to observe that children are expensive, but individuals with families working in entry-level jobs are most in need of embarking on a career progression that will allow them to support their family situation. These families often require multiple wage earners in a household, stretching thin the family support network. The availability and affordability of childcare post-pandemic has put a further strain on working families.

Most workforce customers are looking for a better future for themselves and their families. A career progression lattice lets them see where they are now, what opportunities lay before them, and what it takes to get there. The lattice can help an individual and their case manager highlight education, and skill gaps and provides a concrete vision around which to discuss how a worker can address these gaps and move forward in their career.

[15]A unique feature of the career progression lattice concept is that it is not driven by a de facto continuous educational sequence predicated on award levels, e.g. high school to Community/Technical College to University. Rather the need for higher levels of formal education emerge naturally as skill requirements and wage expectations increase in the upper tiers of the lattice.

[16]The post-pandemic period has been characterized by high inflation, resulting in a roughly 20.7% increase in price levels between January 2021 and October 2024. That translates into roughly $960.69 a month or $5.72 per hour in lost purchasing power for the average individual. This has contributed mightily to workers changing jobs in search of higher earnings just to maintain their standard of living.

Finally, a career progression lattice, sometimes referred to as a career map, is a part of a longer-term educational strategy. In their paper Setting Goals: Who, Why, How? researchers at Harvard University point to the huge value of educational goal setting. Individuals who set goals, including education and career objectives tend to have:

- increased motivation and self-regulation by taking ownership of learning goals
- increased persistence, creativity and risk-taking in achieving goals
- reduced undermining effects of anxiety, frustration, and disappointment,
- enhanced joy, pride & confidence as a result of higher levels of engagement

A career lattice lets an individual visualize a path for occupational mobility and focus attention on personal development. The lattice or career map can be used to lay out a career goal, identify action steps, measure progress, and keep someone heading in a positive direction. Career mapping, like life itself, can be very unpredictable. There are no guarantees that one might not get lost along the way, become satisfied at any given career level, or completely change gears and jump to an entirely different lattice. That's not a problem. As many career commentators remind us, personal growth is about progress, not perfection.

> *"Life is a journey, and every step–no matter how crooked– brings you closer to where you're meant to be."*
>
> Oprah Winfrey

Navigating a Skill-based Career Progression Lattice

As the Heart of Texas employer interviews demonstrate[17] the hiring decision – and which qualities are viewed as important - is influenced by many different factors, including worker qualifications in technical skills, experience, workplace essential or employability skills, and digital information processing skills. From the perspective of the individual, work experience in occupations with similar skills is just one aspect of building a career. Other influencers include experience in the actual occupation, general economic conditions including prevailing labor shortages or surpluses in the region[18], and the general demeanor, competence, and attitude of the applicant, typically referred to as human skills, employability skills, or 'soft skills.'

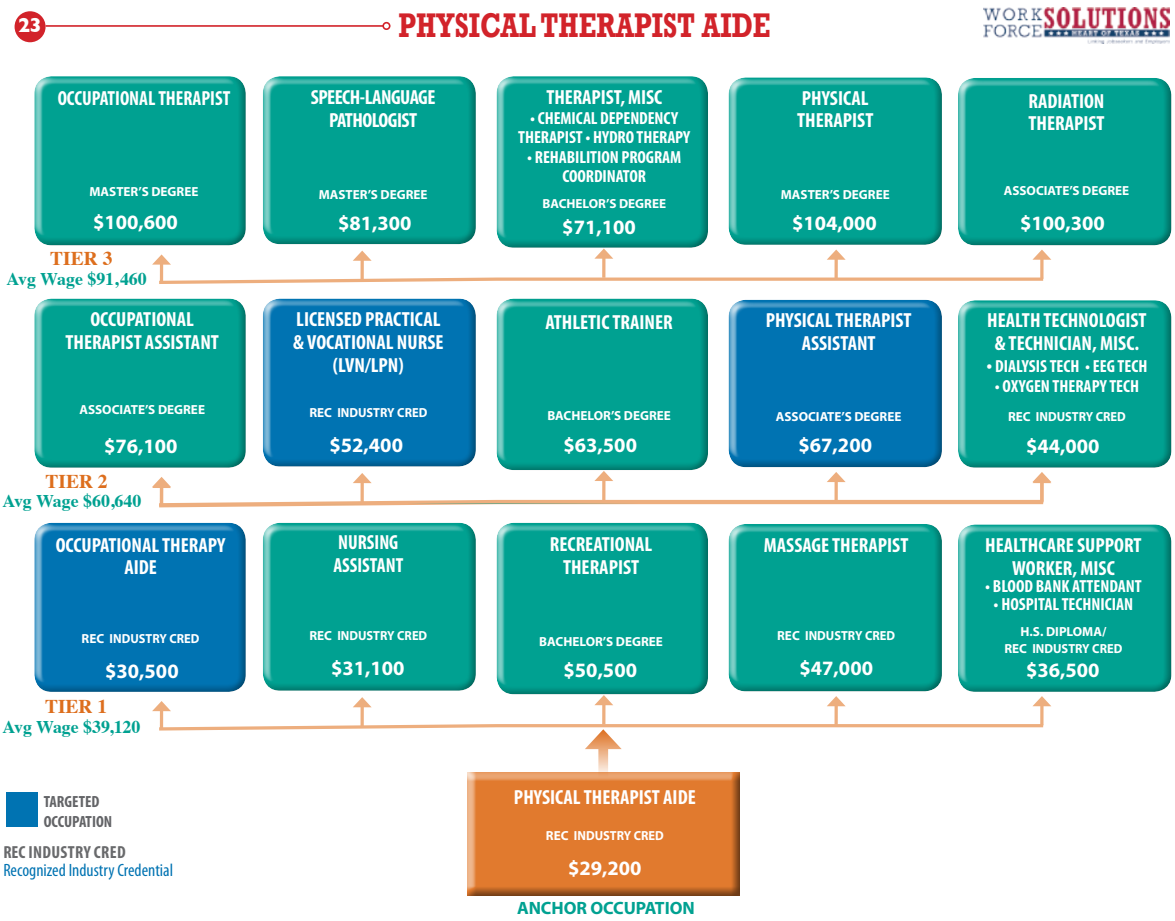
In other cases, specific knowledges, certifications, licenses, or other qualifications may be mandatory to get any given job within an occupation. The HOT lattices show a high percentage of careers that typically require a recognized industry credential. This highlights the need for some additional technical skill training post-high school but not necessarily a Bachelor's or Associate's degree. The career progression lattice is simply a graphic display of possibilities for building a career starting from an entry-level position. But the

[17]Twenty Heart of Texas employer interviews were conducted under the scope of this project. They are available in a separate report titled, *From the Employer Perspective: Interviews with Heart of Texas Employers,* April 2024

[18]Almost all of the Heart of Texas employers interviewed commented on the general shortage of available workers. Labor availability, in turn, influenced how and where they recruited workers, the scope of their recruitment efforts, and the extent to which internal training initiatives were necessary to bring new hires up to speed. The interviews revealed consistent agreement as to the importance of employability skills, such as communication and willingness to learn, as being a high priority at hiring time.

ability to visualize career progression which is not limited to a lifetime of secondary labor market jobs is an important step toward creating an individual career plan, injecting hope and potential into the career development process, and giving the client a realistic view of labor market and earnings opportunity.

The process of navigating your way to career success has to start somewhere. In the labor market that generally means an entry level job. Depending on your educational background and other circumstances, some entry level jobs can be higher-paying than others or carry more responsibility or prestige. In the Computer Design Services industry, for example, even entry-level Computer User Support Specialists or Computer Network Support Specialists tend to require some post-secondary education and are well-compensated.



But everyone has a starting place on their own personal career lattice, which is one reason gaining entry level employment for even the least educated or skilled person is one of the best first steps to long-term career development. To illustrate the value of a Career Progression Lattice let's walk through a lattice diagram with a hypothetical job seeker. We'll name her Linda.

The initial assumption is that Linda is working as a Physical Therapist Aide (or similar job title). Since she is already in this entry level job, Linda's options are simple; to stay in that job or to move forward. She could always stay in the same occupation and perhaps find another job with a company that pays more. This move is not represented on the lattice diagram. Another option not shown on a lattice is an internal promotion from novice Physical Therapy Aide to experienced Physical Therapy Aide - likely with greater responsibility and more pay especially if she earns a relevant certification.

But to move upward requires that she make an important decision; whether or not to acquire additional skills that allow her to compete for jobs in another occupation. In either case, the goal is to forge a better standard of living, e.g., earn higher wages hopefully without sacrificing too much time away from work and family to acquire additional skills. The skill-based lattice shows Linda several careers that require similar types of knowledge and skills. That's why a skill-based career lattice is so intuitively appealing for career development.

If Linda chooses to apply her skills as a Physical Therapist Aide and move upward on a lattice into another occupation, her decision becomes determining the extent to which her same skill set can be applied in another occupation. There are three basic questions she needs to ask herself; 1) how does she determine what those other, higher paying occupations are, 2) to what extent can she rely on her existing skills or what additional skills or training must she acquire to be competitive for jobs (her personal 'skills gap'), and 3) the rate of pay or growth in job opportunities in other occupations sufficiently attractive that it is worth the additional investment in her skill profile? The example of a Physical Therapy Aide career progression lattice begins to answer these questions.

As discussed in the methodology section (Appendix A), a detailed work activity (DWA) skill and knowledge profile was generated for a Physical Therapy Aide using data from SkillsEngine. Similar DWA profiles were also created for each of 843 SOC based occupations weighted by labor market data for the Heart of Texas LWDA[19]. Based on the matching algorithm five SOCs that had the highest skill and knowledge similarity scores, higher wages, and reasonable job opportunities were identified; 1) Occupational Therapy Aide, 2) Nursing Assistant, 3) Recreational Therapist, 4) Massage Therapist, and 5) Miscellaneous Healthcare Support Workers that includes jobs such as Hospital Technician and Blood Bank Attendant. There is no magic to only selecting the top five occupational matches, as many more could be listed. But there is a point at which each subsequent occupational match has diminishing fit or similarity scores - ultimately to the point where skill transferability essentially vanishes.

According to data from Chmura Economics, the 2023 mean annual wage for a Physical Therapy Aide in the Heart of Texas is $29,200. Of the five best transferable options, all five pay more than the Anchor occupation. The Recreational Therapist is the highest paying of the five options but also has the highest education requirement with a Bachelor's degree[20]. Nursing Assistant has a very high skill match, indicating that moving to this occupation will likely require fewer additional skills to become qualified for available job openings. But it is also among the lowest paying options. All five Tier I occupations pay above the wage of the Anchor occupation so none of them is a bad option.

[19]Although DWA profiles were created for 843 occupations, only those occupations that have 10 or more employment were used to calculate each lattice. That lowered the number of actual occupational options to 681 occupations.

[20]The analysis for this lattice uses federal Standard Occupational Classification (SOC) occupational titles. Actual job titles for Physical Therapy Aide might be Rehabilitation Technician, PT Tech, or Restorative Aide. The U.S. Department of Labor ONET Code Connector website at https://www.onetcodeconnector.org/ may be helpful to identify payroll titles. These payroll job titles are very useful when looking for a job because of the firm-specific job titles often used in online postings.

Assuming the objective is to achieve upward wage mobility, Linda is faced with these choices. The easiest step for her (high skill match, less education required) would be to go for a job as a Nursing Assistant. Jobs in this occupation pay almost $2,000 a year more than she's earning now and typically require no more than a few college courses and a Certified Nursing Assistant (CNA) certificate. The highest paying option, Recreational Therapist, would require a Bachelor's degree.

Depending on labor market demand, any of the Tier I occupations would offer upward career mobility. For the purpose of moving forward, Linda looks not just at the wages but also the job duties and other aspects of each occupation. Linda might also want to look at occupations that are much higher on the lattice e.g., Occupational Therapist, or those options that are local Target Occupations[21] and make her choice with those career goals in mind. And onward goes the career progression process.

Let's say, for example, Linda chooses to pursue Massage Therapy. She might look at the specific DWA work activities and sub-knowledge profile required of that job and determine if she has the ability and interest to perform those activities now or to pursue some additional skill-based training to complete her resume. This assessment is her self-evaluation 'skill gap analysis.' During this process she must consider which work activities she will be asked to perform in the new job that she is not currently, nor has she previously, performed. Given her past experience as a Physical Therapy Aide, massage therapy sounds like an interesting move, so she signs up for the Massage Therapy/Therapeutic Massage program (CIP 51.3501) at McLennan Community College. After successfully completing that program, she pursues and gets a job as a Massage Therapist.

After some time in this new position, picking up valuable work experience and new skills, Linda starts thinking about her next step. She references the career lattice diagram and studies her possible moves up the lattice. Based on the same DWA skill and knowledge profiling, the lattice shows that her next 'Tier 2' options are now; 1) Occupational Therapy Assistant, 2) Licensed Vocational Nurse, 3) Athletic Trainer, 4) Physical Therapist Assistant, and 5) Miscellaneous Health Technologists jobs that could include Dialysis Technician or Oxygen Therapy Assistant[22].

The highest skill match among Tier II occupations would be Physical Therapist Assistant, and jobs in this occupation typically require only an Associate's degree. Linda has always been interested in sports and now that her daughter is playing high school basketball the prospects of being an Athletic Trainer are intriguing. Of course that would require a Bachelor's degree and 1,800 hours of clinical experience, but the pay is excellent. Another option, Licensed Vocational Nurse, pays more and has been identified as a Target Occupation in the Heart of Texas region which signifies high demand and above average job growth prospects. *(note: Heart of Texas Target Occupations are highlighted in blue on a lattice).*

[21]If she picks a Target Occupation she may be able to get funding from the WS Heart of Texas for skill training.

[22]Linda could also move laterally within the same tier (Tier 1), choosing perhaps Recreational Therapist for her next career move. A key attribute of the lattice concept is that career development is not always an upward stair-step movement. Depending on life circumstance, someone might move laterally or skip to a higher tier altogether.

Interestingly, at this juncture in the career progression the need for additional education and training starts to become evident, even if the credential is just a recognized industry certification. The reality of more education and training leading to better job opportunities, as depicted on the lattice, represents a real-life skill gap between those that never leave secondary labor market jobs and moving up the lattice to self-sufficiency earnings.

The value of the career lattice approach is that every occupation can be the 'entry level' starting place for career advancement. In the case of Linda, our Physical Therapy Aide, a complete picture of career advancement can be defined and visualized in advance. In some cases, there will be significant additional education, training, or license/certification necessary to make the leap to the next level. While preparing for that next opportunity as a Massage Therapist Linda might continue working as a Physical Therapy Aide, or take a lower paying, part-time job while she finishes her training. Again, the concept of a career lattice conveys the possibility that a person may not have a straight upward career path, and indeed may hit dead ends, make lateral moves, find comfortable stopping places, or leave the labor market altogether for spells of unemployment.

As new levels are reached on the lattice through career change, each new occupation opens another unique set of opportunities which is not directly reflected in the lattice. In the Physical Therapy Aide career lattice, for example, the focus is on the healthcare sector and most of the options are in direct patient care and interpersonal interaction. There are however options that are more technical in nature, where mastery of healthcare technology is equally important. What is not reflected in the lattice are occupations that are in supervisory or teaching roles, although these options exist for almost every occupation shown on a lattice. A supervisory role may also appear as part of an internal career progression with her current employer.

Moreover, each occupation on the lattice represents a new potential Anchor occupation for another - even more personalized - lattice. So what constitutes a Tier 2 occupation on one lattice might be an Anchor occupation on another lattice. Visualize a series of lattices in three-dimensions which are interlaced like a matrix, and you can see the reality, complexity, and interconnectedness of the labor market.

One of the goals of the career progression lattice is to help make career decisions 'informed choices' and thereby reduce the random and uncertain walk often associated with career development. Although job demand is already considered in constructing each career lattice, creating a path through the lattice based on the highest levels of job demand is a very viable strategy. In the career lattices for this project, projected annual average job openings were an important consideration but not the primary driver for occupational selection. However, occupations identified as Target Occupations are automatically interpreted to be in high demand. Choosing these options on a lattice gives added confidence that job openings will be available once a worker has acquired the requisite skills.

Returning to Linda and the Physical Therapist Aide career lattice, let's assume that Linda decided her ultimate professional goal is to be a Physical Therapist. Note that Physical Therapist is on the lattice, but it is a Tier 3 option. There is nothing wrong with this choice, but there is a significant formal education gap between massage therapy and physical therapy. Thus, even though Linda's ultimate goal is to become a Physical Therapist, she

will start her journey by pursuing work as a Physical Therapy Assistant, which is on Tier 2 of the lattice and requires an Associate's degree. This decision might represent personal values unrelated to the career progression lattice or job demand, such as the ability to be a role model or mentor, desirable work environment and working conditions, or other job characteristics. It is impossible to factor in every aspect of a career choice into a static career progression lattice. But job characteristics should not be ignored. There are many useful tools to help a job seeker better understand job characteristics such as the Occupational Outlook Handbook (https://www.bls.gov/ooh/) and the ONET Code Connector at O*NET Code Connector (onetcodeconnector.org).

As the career progression process continues to unfold, the career lattice diagram for Physical Therapy Aide provides five Tier III options; 1) Physical Therapist, 2) Occupational Therapist, 3) Radiation Therapist, 4) Speech-Language Pathologist, and 5) Miscellaneous Therapists, which can include Chemical Dependency Therapist, Hydro Therapy, and Rehabilitation Program Coordinator. The miscellaneous category is intentionally broad to include a variety of more niche job specialties. On the positive side, it opens the door to exploring a wide variety of unique jobs. On the negative side, it's likely that there will be far fewer job opportunities in these occupations and labor market information may be hard to find. Also note that as Linda progresses up the career lattice she faced the reality that many career movements require formal higher education investments. There may be a movement toward more skill-based hiring but the route to many of the highest paying occupations still runs through formal higher education.

In a detailed analysis of the skills associated with a select group of Anchor Occupation – Target Occupation pairs, there was great variation in some pairs between the skills one has in an Anchor Occupation and the skills needed to compete for jobs in the Target Occupation. For example, in the Physical Therapy Aide lattice, the gap analysis with the occupation Physical Therapy Assistant shows 61 high-complexity skills[23] in common and only 8 that are unique to a Physical Therapy Assistant. With this 88.4% overlap of skills, a move between these two occupations is practically seamless. However, the skill link between

Easiest Paths from HOT Anchor to Target Occupation

Anchor OCC Title	Lattice Tier	Target OCC Title	Total DWAs	Already Have DWAs	Need to Learn DWAs	Ratio of Already Have to Total
Physical Therapist Aides	Tier 2	Physical Therapist Assistants	69	61	8	88.4%
Maintenance & Repair Workers, General	Tier 1	Industrial Machinery Mechanics	156	104	52	66.7%
Recreational Vehicle Service Techs	Tier 2	Bus/Truck Mechanics & Diesel Engine Specialists	102	68	34	66.7%
Recreational Vehicle Service Techs	Tier 1	Automotive Service Techs & Mechanics	122	78	44	63.9%
Maintenance & Repair Workers, General	Tier 1	Heating, A.C. & Refrigeration Mechanics/Techs	167	106	61	63.5%
Maintenance & Repair Workers, General	Tier 2	Mobile Heavy Equipment Mechanics, ex. Engines	114	69	45	60.5%
Outdoor Power & Other Small Engine Mechanics	Tier 1	Bus/Truck Mechanics & Diesel Engine Specialists	102	60	42	58.8%
Installation, Maintenance & Repair Workers, MISC	Tier 1	Heating, A.C. & Refrigeration Mechanics/Techs	167	97	70	58.1%
Construction Laborers	Tier 1	Carpenters	110	62	48	56.4%
Installation, Maintenance & Repair Workers, MISC	Tier 2	Industrial Machinery Mechanics	156	86	70	55.1%
Nursing Assistants	Tier 1	Licensed Practical & Vocational Nurses	114	62	52	54.4%
Nursing Assistants	Tier 2	Physical Therapist Assistants	69	36	33	52.2%
Maintenance & Repair Workers, General	Tier 3	Aircraft Mechanics & Service Technicians	127	66	61	52.0%
Recreational Vehicle Service Techs	Tier 2	Mobile Heavy Equipment Mechanics, ex. Engines	114	59	55	51.8%
Outdoor Power & Other Small Engine Mechanics	Tier 1	Automotive Service Techs & Mechanics	122	63	59	51.6%

[23]For the skill gap analysis only skills that typically require some level of academic or technical training are considered.

Nursing Assistant and Licensed Vocational Nurse shows 62 out of 114 skills (54.4%) in common with 52 skills that must be mastered to be fully qualified for available LVN jobs. Large gaps between the skills-in-common and unique Target Occupation skills point to a steeper learning curve that likely involves technical training.

Ultimately, Linda's career journey may not end as a Physical Therapist. She might go on to a teaching position or move into a supervisory or administrative role at a later stage of her career. While the lattice lays out occupational options, the career progression process only closes when an individual has decided that they are no longer interested in wage growth, willing to engage in additional formal academic training, or accept new learning challenges. As famous author Ayn Rand once said, "The question isn't who is going to let me; it's who is going to stop me." In the world of career progressions, you are never too old, never too burdened to set another goal and dream a new dream.

Occupational Mobility and Formal Education

It is important to distinguish between workers in low wage jobs and the 'low wage worker' label. Many people working in lower wage jobs have skills and aspirations but at any moment in time find themselves working in a job that is relatively low paying. The stigma of being branded a 'low wage worker' hinders one's ability to think beyond their current situation, negatively impacts self-esteem, and dampens enthusiasm for work. Although everyone has to start somewhere on their career journey, the lattice concept demonstrates that one is not destined to work forever in a low wage occupation. There are options to leverage and add to one's skill set to build upward career and wage mobility. There are no low wage workers, only lower wage jobs.

Since many occupations on the lattice will require additional postsecondary education, it is important to understand which education programs lead to employment in those occupations and which regional institutions offer those programs. Because career progressions are built around the notion of transferable skills, in an ideal world identified skill deficits to reach a higher tier occupation would be addressed through skill-centric, competency-based programs. However, in the absence of such options, skill deficits can be addressed through regular workforce or academic instructional curricula.

There has been a push to reimagine the use of Pell grant funds to support non-degree workforce programs. *Workforce Pell Grant Act* HR 6585 is an amendment to the Higher Education Act of 1965 with a goal of extending Pell grant eligibility to high quality, short-term workforce programs. It is envisioned to work in conjunction with the reauthorized WIOA legislation in support of skill acquisition from a broader list of alternative providers. HR 6585 is written to facilitate the use of federal Pell grant funds for skill-based, short-term workforce development including those funded through local workforce boards. By bolstering these programs at community and technical colleges the bill aspires to help more students gain market-relevant skills that lead to good-paying jobs and strengthen the talent pipeline for regional employers. Despite broad favorability, the 118th Congress adjourned leaving this bill in committee. It is noteworthy however that this bill both promotes training through community and technical colleges and supports skills training that may not be part of a degree-centric program.

The chart below illustrates several local training options to help a worker move to one of the identified Heart of Texas Target Occupations. Although formal education is not always the only route to occupational mobility, this example shows that there are generally formal training options that can facilitate the process[24]. The chart illustrates that in some cases there are multiple educational programs that can serve to address skill deficits.

Sample Linkages between HOT Target Occupations and Related CIP Education Programs

2018 SOC Code	HOT TARGET - SOC Title 2018	2020 CIP Code	CROSSWALK - CIP Title 2020 (These are CIP programs related to the Target Occupation)	Strength of Connection	HOT College	Grad Count 2021	Grad Count 2022
49-3011	Aircraft Mechanics and Service Technicians	15.0801	Aeronautical/Aerospace Engineering Technology/Technician	Close	No Regional Offerings		
49-3011	Aircraft Mechanics and Service Technicians	47.0608	Aircraft Powerplant Technology/Technician.	Direct	Texas State Technical College	21	27
49-3011	Aircraft Mechanics and Service Technicians	47.0607	Airframe Mechanics and Aircraft Maintenance Technology	Direct	Texas State Technical College	20	29
51-2011	Aircraft Structure, Surfaces, Rigging & Systems Assemblers	15.0801	Aeronautical/Aerospace Engineering Technology/Technician	Close	No Regional Offerings		
51-2011	Aircraft Structure, Surfaces, Rigging & Systems Assemblers	47.0608	Aircraft Powerplant Technology/Technician.	Close	Texas State Technical College	21	27
51-2011	Aircraft Structure, Surfaces, Rigging & Systems Assemblers	47.0607	Airframe Mechanics and Aircraft Maintenance Technology	Close	Texas State Technical College	20	29
49-3023	Automotive Service Technicians and Mechanics	47.0617	High Performance and Custom Engine Technician/Mechanic.	Close	No Regional Offerings		
49-3023	Automotive Service Technicians and Mechanics	47.0613	Medium/Heavy Vehicle and Truck Technology/Technician.	Close	No Regional Offerings		
49-3023	Automotive Service Technicians and Mechanics	47.0614	Alternative Fuel Vehicle Technology/Technician	Direct	No Regional Offerings		
49-3023	Automotive Service Technicians and Mechanics	47.0604	Automobile/Automotive Mechanics Technology/Technician.	Direct	Hill College	66	45
49-3023	Automotive Service Technicians and Mechanics	47.0605	Diesel Mechanics Technology/Technician.	Close	Texas State Technical College	60	122
49-3023	Automotive Service Technicians and Mechanics	47.0604	Automobile/Automotive Mechanics Technology/Technician.	Direct	Texas State Technical College	61	73
49-2091	Avionics Technicians	29.0402	Air and Space Operations Technology	Close	No Regional Offerings		
49-2091	Avionics Technicians	47.0103	Communications Systems Installation and Repair Technician.	Close	No Regional Offerings		
49-2091	Avionics Technicians	15.0303	Electrical, Electronic & Communications Engineering Technician	Close	No Regional Offerings		
49-2091	Avionics Technicians	47.0101	Electrical/Electronics Equipment Installation & Repair Technician	Close	No Regional Offerings		
49-2091	Avionics Technicians	15.0404	Instrumentation Technology/Technician.	Close	Texas State Technical College	33	36
49-2091	Avionics Technicians	47.0609	Avionics Maintenance Technology/Technician.	Direct	Texas State Technical College	5	22
43-3031	Bookkeeping, Accounting, and Auditing Clerks	52.0303	Auditing	Close	No Regional Offerings		
43-3031	Bookkeeping, Accounting, and Auditing Clerks	52.0301	Accounting.	Close	Baylor University	137	125
43-3031	Bookkeeping, Accounting, and Auditing Clerks	52.0301	Accounting.	Close	McLennan Community College	15	9
43-3031	Bookkeeping, Accounting, and Auditing Clerks	52.0302	Accounting Technology/Technician and Bookkeeping.	Direct	McLennan Community College	11	12
43-3031	Bookkeeping, Accounting, and Auditing Clerks	52.0301	Accounting.	Close	Navarro College	10	8
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	47.0613	Medium/Heavy Vehicle and Truck Technology/Technician.	Direct	No Regional Offerings	0	0
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	47.0604	Automobile/Automotive Mechanics Technology/Technician.	Close	Hill College	66	45
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	47.0302	Heavy Equipment Maintenance Technology/Technician.	Close	Navarro College	1	0
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	47.0604	Automobile/Automotive Mechanics Technology/Technician.	Close	Texas State Technical College	61	73
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	47.0605	Diesel Mechanics Technology/Technician.	Direct	Texas State Technical College	60	122
13-1199	Business Operations Specialists, All Other	52.0208	E-Commerce/Electronic Commerce.	Close	No Regional Offerings	0	0
13-1199	Business Operations Specialists, All Other	52.0205	Operations Management and Supervision	Close	No Regional Offerings	0	0
13-1199	Business Operations Specialists, All Other	14.3701	Operations Research.	Close	No Regional Offerings	0	0
47-2031	Carpenters	46.0415	Building Construction Technology/Technician	Close	No Regional Offerings	0	0
47-2031	Carpenters	48.0701	Woodworking, General	Close	No Regional Offerings	0	0
47-2031	Carpenters	46.0201	Carpentry/Carpenter.	Direct	No Regional Offerings	0	0
15-1299	Computer Occupations, All Other	26.1103	Bioinformatics.	Close	Baylor University	6	2
15-1299	Computer Occupations, All Other	09.0702	Digital Communication and Media/Multimedia	Close	Baylor University	0	0
15-1299	Computer Occupations, All Other	52.0407	Business/Office Automation/Technology/Data Entry.	Close	McLennan Community College	22	16
15-1299	Computer Occupations, All Other	11.0301	Data Processing and Data Processing Technology/Technician.	Close	McLennan Community College	6	15
15-1299	Computer Occupations, All Other	52.0407	Business/Office Automation/Technology/Data Entry.	Close	Navarro College	3	0
15-1299	Computer Occupations, All Other	11.0301	Data Processing and Data Processing Technology/Technician.	Close	Navarro College	6	7
15-1299	Computer Occupations, All Other	50.0706	Intermedia/Multimedia.	Close	Navarro College	0	0

[24]This illustration is only a snapshot from a more extensive database delivered under the scope of this project that shows the related CIP programs associated with each of the Heart of Texas Target Occupations. Ideally, competency-based curricula could be developed that teach a finite number of skills within a short time period that a worker could use to address their skill deficit. The table includes the most likely formal education and training options.

The Potential Economic Impact of Career Upskilling

The post-pandemic labor shortage has helped business realize one thing in particular; to value their existing workforce. There is considerable research into the increasingly shorter shelf-life of skills and the importance of investing in the workforce. But there is an added significance of career upskilling to the economic development community. Namely, economic impact or return on investment (ROI) calculations can be applied to career progression with surprising results. In this case, let's examine the potential economic impact of upskilling the Heart of Texas regional workforce. In particular, a calculation of the direct wage impact of entry-level workers moving from Anchor occupations to Tier I or Tier II occupations.

Heart of Texas Regional Wage Impact through Career Progressions

	Anchor Occupation Lattice	HOT LWDA 2023Q3 EMP	Median Wage of Anchor	AVG Earnings Gain from Anchor to Tier 1	AVG Earnings Gain from Anchor to Tier 2	Total Earnings Increase to Tier 1	Total Earnings Increase to Tier 2
	(A)	(B)	(C)	(D)	(E)	(F)	(G)
	Total, All Anchor Occupations (10% = 2,521 clients)	25,212	$35,650	$8,587	$20,060	$19,758,203	$50,572,136
1	Installation, Maintenance & Repair Helpers	191	$32,200	$16,080	$22,407	$307,128	$427,974
2	Computer User Support Specialists	530	$51,000	$15,940	$36,000	$844,820	$1,908,000
3	Motor Vehicle Operators, MISC	60	$25,600	$14,470	$26,980	$86,820	$161,880
4	Emergency Medical Technicians	145	$32,500	$13,780	$30,860	$199,810	$447,470
5	Personal Service Workers Supervisor	183	$36,500	$13,440	$23,740	$245,952	$434,442
6	Installation, Maintenance & Repair Workers, MISC	184	$39,200	$12,180	$21,071	$224,112	$387,706
7	Tire Repairers & Changers	164	$31,200	$11,900	$21,184	$195,160	$347,418
8	Electricians Helpers	100	$37,200	$11,180	$23,287	$111,800	$232,870
9	Security Guards	848	$29,800	$10,760	$25,020	$912,448	$2,121,696
10	General Maintenance & Repair Workers	1,785	$38,900	$10,200	$12,960	$1,820,700	$2,313,360
11	Retail Salespersons	4,036	$30,300	$10,080	$18,160	$4,068,288	$7,329,376
12	Nursing Assistants	1,475	$31,100	$9,980	$40,260	$1,472,050	$5,938,350
13	Physical Therapist Aides	46	$29,200	$9,920	$31,440	$45,632	$144,624
14	Hotel, Motel, & Resort Desk Clerks	227	$24,700	$9,340	$16,160	$212,018	$366,832
15	Home Health Aides	915	$22,800	$8,700	$33,220	$796,050	$3,039,630
16	Team Assemblers	1,326	$36,100	$8,300	$19,440	$1,100,580	$2,577,744
17	Multiple Machine Tool Operators	130	$34,200	$8,220	$22,180	$106,860	$288,340
18	Protective Service Workers, Miscellaneous	42	$40,200	$8,200	$18,540	$34,440	$77,868
19	Production Workers Helpers	429	$34,000	$7,300	$19,340	$313,170	$829,686
20	Pharmacy Aides	29	$29,500	$7,160	$21,980	$20,764	$63,742
21	Recreational Vehicle Service Techs	29	$37,700	$6,560	$15,380	$19,024	$44,602
22	Industrial Automation Technicians	273	$54,700	$6,491	$18,660	$177,204	$509,418
23	Construction Laborers	2,193	$36,200	$6,140	$16,660	$1,346,502	$3,653,538
24	Customer Service Representatives	3,323	$36,300	$6,080	$23,160	$2,020,384	$7,696,068
25	Outdoor Power & Other Small Engine Mechanics	47	$41,900	$5,760	$22,780	$27,072	$107,066
26	Stockers & Order Fillers	3,013	$34,700	$5,760	$11,820	$1,735,488	$3,561,366
27	Assemblers and Fabricators, All Other	240	$37,100	$4,960	$16,920	$119,040	$406,080
28	Medical Equipment Preparers	51	$37,600	$4,661	$20,860	$23,771	$106,386
29	Institution & Cafeteria Cooks	638	$29,000	$3,700	$15,380	$236,060	$981,244
30	General Office Clerk	2,560	$37,400	$3,380	$14,720	$865,280	$3,768,320
31	Compliance Officers	356	$58,100	$1,960	$8,400	$69,776	$299,040

For this analysis assume a scenario whereby just 10 percent of all currently employed persons in the 31 designated Anchor occupations earn entry into a Tier I occupation. The chart above shows the additional wages that would be earned by those individuals, broken out by Anchor occupation. With 25,212 total employed persons in the Heart of Texas in the 31 Anchor occupations, 10 percent of that total would be 2,521 workers. The average earnings gains from an Anchor occupation to the average Tier I earnings is $8,587. This approach results in an expected increase in regional wages of just short of $20 million. Predictably, occupations with the most entry-level workers combined with the greatest earnings spread between Anchor and Tier I occupations contribute the greatest overall wage impact.

If those same workers made it to Tier II occupations the gross wage impact would be $50.5 million. This gross impact calculation does not include a household multiplier effect (induced effect) that would occur as each worker spends their additional earnings in their local community. If you add in a 1.5 household multiplier and assume the majority of the consumer spending occurs locally, the gross economic impact could be closer to $75.86 million of additional money circulating in the regional economy. Clearly, increasing individual human capital and promoting upward career mobility of the regional labor force can have a significant impact on the entire community.

Limitations and Challenges

The lattices are built around skill profiles developed for each SOC occupation. Groundbreaking work from TSTC/*SkillsEngine* has resulted in a robust DWA-centric skill library which now includes sub-knowledge and workplace essential domains crucial to the career progression methodology used in this project. Unfortunately, the actual job description language used in the federal SOC taxonomy is quite limited and has very terse definitions about what workers actually do in each occupation. The thin descriptive text makes it more difficult to fully explore the transferable skills that connect various occupations using text parsing and natural language processing techniques. To minimize this challenge, project staff created expanded job description language for the Target Occupations using online job postings and text published in the Occupational Outlook Handbook by the Bureau of Labor Statistics.[25]

The issue of thin job description language is also problematic with online job postings. In his article *Why 'Job Description Laziness' is killing Skills-based Hiring* Brandon Busteed notes that most companies do not routinely update or revise internal job descriptions to keep up with changing technologies, business processes, or work roles. He also says that when it's time to fill a job, managers seldom carefully review posting language, solicit input from colleagues, or move beyond internal job description language[26]. Moreover, in a nod to potential Millennial and Gen Z applicants, current job postings explain more about the culture of the company and why working there would be attractive than actual job responsibilities. All this limits our ability to communicate to students what an occupation is all about, understand critical job skills, and how skills can be transferred across job opportunities. It also leads to the continued use of formal educational credentials in applicant selection despite claims of skills-based hiring preference. So, while transferable skills are increasingly seen as the more important metric this is not always the case at hiring time.

> *"The reality is that we're not very good at identifying skills needed for most jobs. We don't include manager observations in an employee's skill profile in our HR systems, and instead rely on self-reporting of skills, which can be inaccurate."* Rachael Bourque, Senior Vice President of *Corporate Learning Solutions at Kaplan*

[24]The expanded job descriptions also benefitted from generative AI processing. Another deliverable for this project was a 'recruiting-based' job description which describes each Target Occupation in a manner intended to stir the interest of high school students.

[25]Why *'Job Description Laziness' is Killing Skills-based Hiring,* Brandon Busteed, Forbes Online, March 29, 2024

A second challenge is not methodological but a simple artifact of the labor market itself. Especially in smaller labor markets, the breadth and diversity of job opportunities may be limited. The universe of occupations covered in the Chmura Economics database for the Heart of Texas region covers 834 occupations. Only 681 occupations that had 10 more regional employment were included in the lattice calculations. In the Heart of Texas region, fifty percent of all projected job openings through 2033 are in just 35 occupational titles. Seventy-five percent of all projected openings are in 112 occupations, and ninety percent are found in just 257 occupations. To describe this phenomena in another way, seventy-five percent of the region's projected openings can be found in just over thirteen percent of all the occupational titles in the employment universe. While larger regions typically have more diversity than smaller regions, these figures are almost identical to Texas statewide. The bottom-line is that high concentrations of job openings are found in fewer occupations than one might expect, which also adds some duplication to lattices that follow a singular industry sector such as manufacturing. And, in this labor market context, a career lattice that lists 15 occupations across 3 tiers is likely to include some occupations for which there may be limited regional job demand.

In 'real life,' some occupations may be connected not by a multitude of similar skills but by a handful of very critical skills. For example, Health Information Technologists sit at the nexus of healthcare, information technology, and administrative occupations. The SOC title Billing and Posting Clerk includes jobs as Medical Reimbursement Specialists, which has many transferable skills with Health Information Technologist. These two occupations are not linked in the analysis feeding the career lattice because their DWA profiles don't show extensive commonality. However, they do share a small number of highly transferable sub-knowledges that should be considered in a career progression.

> *"The opportunities that exist in your zip code might be very different from the opportunities that exist across the country. So, you have to focus on the things you can control when it comes to work." The things in your control include where you decide to live, what skill you decide to pursue, and how hard you work."*
>
> Mike Rowe, Host/Producer of *Dirty Jobs*

Teaching and Managing occupations represent opportunities that are not well-captured in skill or knowledge-based analysis. As one would expect, the upper tiers of several lattices show supervisory and managerial occupational options. Clearly, those with technical expertise in related fields and work experience (gained by moving up the lattice) are more likely to supervise the work of others in related occupations. However, the DWA domain is designed to describe specific work activities performed and is less concise on aspects of an occupation that might fall within a management domain, i.e. Directing, Coaching/Mentoring, Supporting/Motivating, and Delegating[27]. Thus, the DWA approach does a better job incorporating front-line supervisor roles in which incumbents often work in tandem with those they supervise, but less well for higher order managerial roles. The same is true with the sub-knowledge domain. Sub-knowledges linked to performing

[27]Although these dimensions of management are not unique, these specific categories are adapted from *Triggers: Creating Behavior That Lasts,* Marshall Goldsmith, Crown Publishing, 2015

a work activity are often not the same as those needed to teach that activity. In several instances, college instructional jobs are a good fit for higher tiers in a lattice. For other lattices, instructors may earn less than practitioners (e.g., nursing), limiting their inclusion. A separate cosine similarity analysis that concentrated just on teaching and managerial occupations confirmed relatively low similarity coefficients with the occupations they were designed to teach or manage.

Another reality of career lattices is that not all anchor occupations have the same breadth of higher-paying, similar occupations. Some lattices are simply flatter, with fewer high-paying options. The lattices show much broader earnings spreads for information technology and healthcare occupations than production occupations. Production jobs, such as a numerical computer control (CNC) machine operator and tool-and-die maker, which require specific credentials or experience pay well by middle-skills standards. However, their career lifetime value is lower as fewer production jobs have a clear pathway to other, higher-paying jobs. Earnings gains typically come through internal company wage increases. Better-paying jobs further up a manufacturing company's hierarchy tend to be supervisory, which can require a very different skill set. They require extensive experience, and the ratio of supervisory personnel to front-line staff is such that rates of advancement are likely to be slow. In other words, machinists or tool-and-die makers are likely to remain machinists or tool-and-die makers for a longer time with fewer transferable skills and less cross-occupational movements.

Another distinction is between career mobility in the external job market versus growth internally within a company. Upward mobility under or within the same occupational title is not uncommon. For some occupations upward movement under the same general occupational title is as much the norm as changing to a different occupational title or career field. One might have the job title of Web Developer, for example, but move upward within a company by adding to their skill set and capabilities, either formally or informally. They may hold other job titles such as Interface Designer, Internet Architect, Usability Specialist, or Webmaster that offer increased pay or prestige within their organization, but their federal SOC occupational title might still fall under Web Developer. In other words, an internal career ladder could include the same SOC occupational title in the second or third tier of job possibilities. However, each higher level would represent additional duties and responsibilities, greater technical expertise requirements, and concomitantly higher pay.

The federal SOC occupational taxonomy used in this analysis is built around discrete titles and thus it does not address this important source of upward career mobility. Thus, the notion of upward mobility within a company is not captured in a career lattice which presumes job AND company change. This is not so much a flaw in the career lattice concept as it is a limitation on data collected for much more detailed job titles, data for individual companies, and a reflection of possible career progressions even within the same occupational category.

Another data limitation relating to the SOC taxonomy is the fact that roughly 10 percent of all occupational titles are Miscellaneous or 'All Other' categories, encompassing employment from a wide array of payroll job titles for which data are not separately collected. Using these 'All Other' occupational titles in a personal career lattice is imprecise at best and, while it may fit some profiles, the titles tend to be less actionable for career development

planning. When 'All Other' occupational titles are included in a career progression lattice for this project, sample job titles that fall under that title are also listed[28] .

Getting a job and forging a career progression is not always about transferable work activities, technical skills, or even common academic knowledge. The ideal job candidate also has appropriate academics, work experience, employability skills, digital literacy, and perhaps a requisite license/certification. But increasingly, and especially in a labor shortage environment, positive workplace employability skills, a willingness to show up on time, and learn new skills commands just as much attention as a formal credential. In the interviews with Heart of Texas employers the importance of workplace employability skills such as verbal communication, human interaction, reliability, and trainability were frequently repeated.

Finally, a career progression model does not pretend that moving from traditional secondary labor market jobs to primary labor market jobs is an easy endeavor. It is not. Navigating a personalized lattice requires individual initiative and determination on the part of the worker - and probably some financial and emotional support along the way. As Christopher Moody, TSTC Director of Talent Acquisition reminds us, "success doesn't come to you; you go to it."

> *"Success doesn't come to you; you go to it."*
> Christopher Moody,
> **TSTC Talent Acquisition Director**

Career progressions also represent a vote for increased competency-based instruction or work-based learning (CBI/WBL) opportunities within higher education; perhaps something that acknowledges the skill layering model discussed in Appendix B which recognizes that skill acquisition comes from multiple experiences and modalities over a lifetime[29] . It also encourages workforce development and related training intermediaries to think about skill acquisition as the common currency for contract training investments.

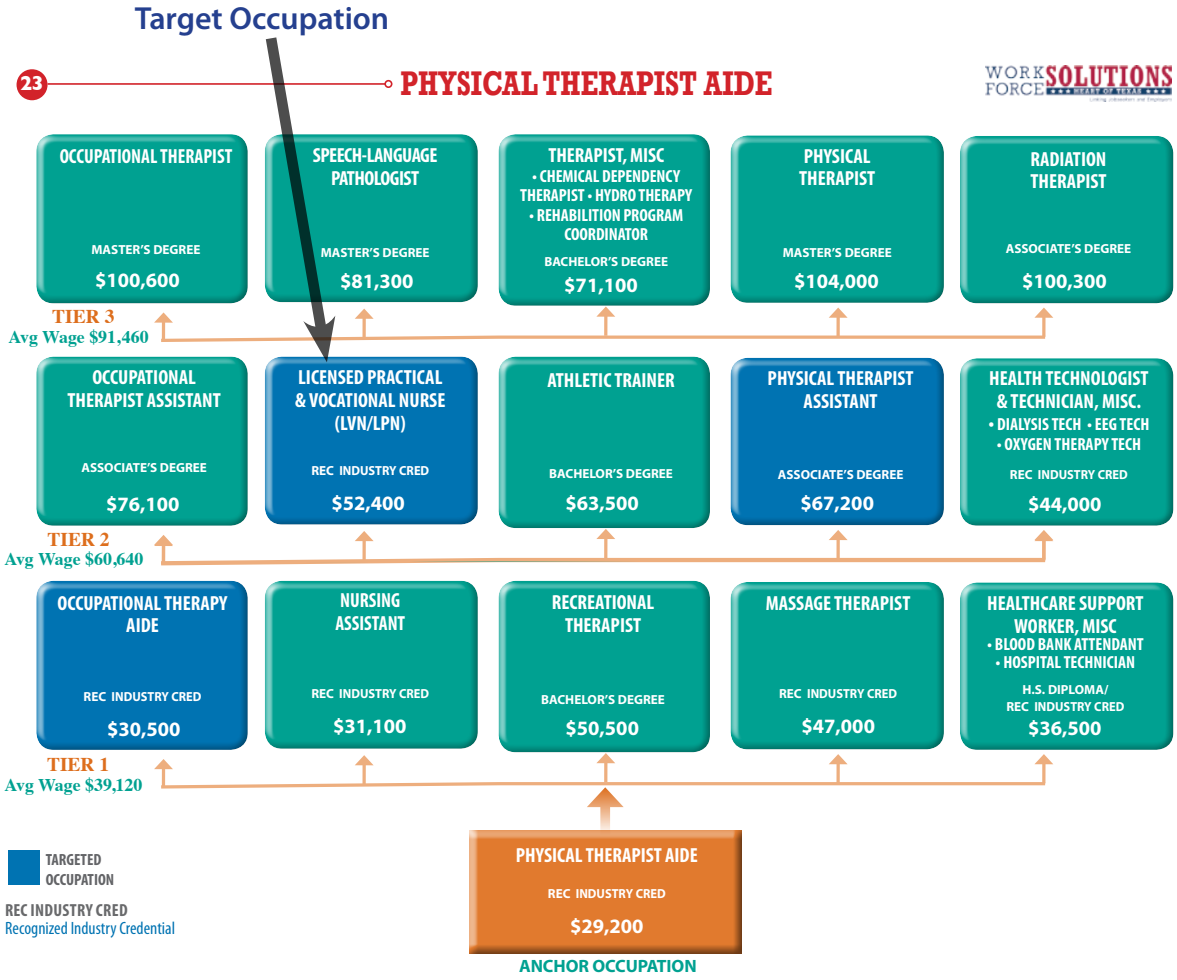
In summary, the career progression lattice model is a simple approach to explain reasonable, upward career movements based on skill and sub-knowledge acquisition. It provides a two-dimensional roadmap to better understand what is otherwise a complex, multi-dimensional concept known as career development. The career lattice diagrams provide clear, actionable, decision-critical information to help inform and guide students, dislocated workers, and other labor market participants through the maze that is the American labor market. The skill layering model reinforces the notion that lifelong learning is critical to upward career mobility and that continual skill acquisition is the secret sauce to higher earnings. As these career progression lattices demonstrate, navigating an upward career path is possible, no matter where you start. There is a bright future ahead for anyone willing to take the journey!

[28]Employers tend to use job titles that are unique to their own operations and frequently do not exactly match the titles that appear in the federal Standard Occupational Classification taxonomy. The workforce and education system is always challenged to translate these unique 'payroll' job titles to a matching SOC occupation title. The interviews conducted during this project unveiled many such titles, some of which might be classified under the 'All Other' option.

[29]There are many emerging models for micro-credentials, badges, and other short program offerings. Coursera, for example, offers a series of online 'specializations' that include between 5 and 10 courses and fall in subject areas such as Value Chain Management, Big Data, Business Foundations, and Data Science. CBI will also become more critical as older students return to higher education for upskilling opportunities – preferably to be accomplished in the shortest possible timeframe.

Heart of Texas Career Progression Lattices

The thirty (30) lattice diagrams depicted in this report each start with an Anchor occupation. The objective was to delineate possible, skill-based career pathways for workers starting in entry-level occupations[30]. Each of these lattice diagrams includes one or more Target Occupations identified by the Heart of Texas LWDB as having above average employment and wage opportunity in the region. The Target Occupations are illustrated by **blue boxes** among the many occupational possibilities on each lattice. Because a significant focus of the Workforce Solutions Heart of Texas workforce development mission is to prioritize career and technical training opportunities for sub-baccalaureate jobs, most – but not all - of the Target Occupations typically require less than a Bachelor's degree.



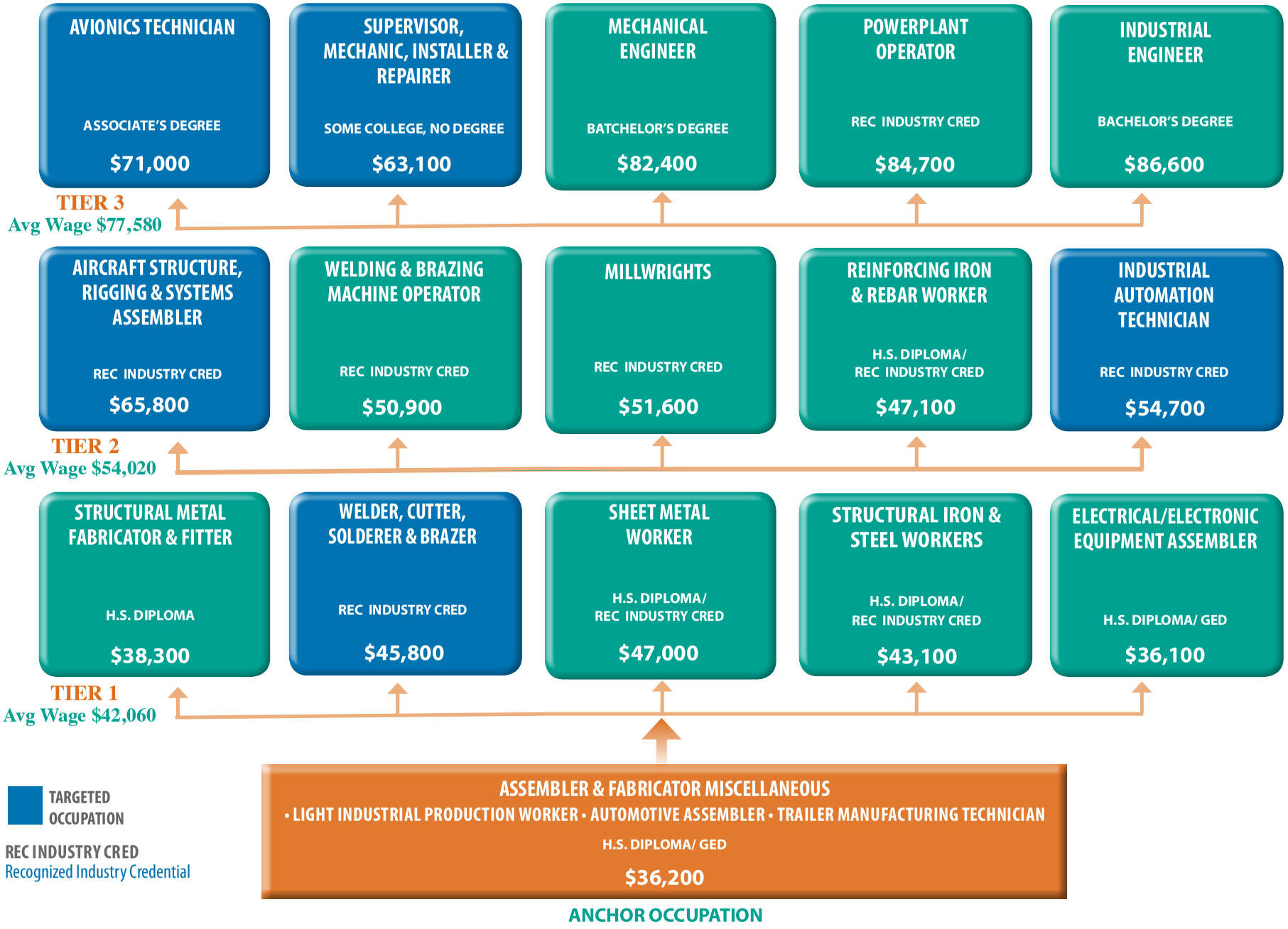
[30]See Appendix *A Methodology and Approach to Building Career Progression Lattices* for an explanation of how anchor occupations were determined.

INDEX: Career Lattices Linked to Target Occupations					
Anchor Lattice Short Title	Target Occupational Title	Tier	Anchor Lattice Short Title	Target Occupational Title	Tier
Assemblers & Fabricators, MISC	Aircraft Structure, Rigging, & Systems Assemblers	Tier 2	Medical Equipment Preparers	Dental Assistants	Tier 1
Assemblers & Fabricators, MISC	Avionics Technicians	Tier 3	Medical Equipment Preparers	Dental Hygienists	Tier 3
Assemblers & Fabricators, MISC	Industrial Automation Technician	Tier 2	Medical Equipment Preparers	Licensed Practical & Vocational Nurses	Tier 2
Assemblers & Fabricators, MISC	Supervisors, Mechanics, Installers & Repairers	Tier 3	Medical Equipment Preparers	Radiologic Technologists/Techs	Tier 2
Assemblers & Fabricators, MISC	Welders, Cutters, Solderers & Brazers	Tier 1	Motor Vehicle Operators, MISC	Heavy Tractor-Trailer Truck Drivers	Tier 1
Compliance Officers	Business Operations Specialists, MISC	Tier 1	Multiple Machine Tool Operators	Aircraft Mechanics & Service Technicians	Tier 3
Compliance Officers	Project Management Specialists	Tier 2	Multiple Machine Tool Operators	Aircraft Structure, Rigging, & Systems Assemblers	Tier 2
Computer User Support Specialists	Computer Occupations, MISC	Tier 2	Multiple Machine Tool Operators	Welders, Cutters, Solderers & Brazers	Tier 1
Computer User Support Specialists	Project Management Specialists	Tier 1	Nursing Assistants	Licensed Practical & Vocational Nurses	Tier 1
Computer User Support Specialists	Software Q.A. Analysts & Testers	Tier 2	Nursing Assistants	Physical Therapist Assistants	Tier 2
Construction Laborers	Carpenters	Tier 1	Nursing Assistants	Radiologic Technologists/Techs	Tier 2
Cooks, Institution & Cafeteria	Food Service Managers	Tier 2	Nursing Assistants	Registered Nurses	Tier 2
Customer Service Representatives	Production, Planning, & Expediting Clerks	Tier 2	Nursing Assistants	Respiratory Therapists	Tier 2
Emergency Medical Technicians	Licensed Practical & Vocational Nurses	Tier 1	Outdoor Power & Other Small Engine Mechanics	Aircraft Mechanics & Service Technicians	Tier 2
Emergency Medical Technicians	Physical Therapist Assistants	Tier 2	Outdoor Power & Other Small Engine Mechanics	Automotive Service Techs & Mechanics	Tier 1
Emergency Medical Technicians	Radiologic Technologists/Techs	Tier 2	Outdoor Power & Other Small Engine Mechanics	Avionics Technicians	Tier 2
Emergency Medical Technicians	Respiratory Therapists	Tier 2	Outdoor Power & Other Small Engine Mechanics	Bus/Truck Mechanics & Diesel Engine Specialists	Tier 1
General Office Clerk	Bookkeeping, Accounting, & Auditing Clerks	Tier 1	Outdoor Power & Other Small Engine Mechanics	Electrical Power & Industrial Systems Tech	Tier 3
General Office Clerk	Computer User Support Specialists	Tier 2	Outdoor Power & Other Small Engine Mechanics	Mobile Heavy Equipment Mechanics, ex. Engines	Tier 1
General Office Clerk	Dental Assistants	Tier 1	Outdoor Power & Other Small Engine Mechanics	Supervisors, Mechanics, Installers & Repairers	Tier 3
General Office Clerk	Paralegals & Legal Assistants	Tier 2	Pharmacy Aides	Pharmacy Technicians	Tier 1
General Office Clerk	Pharmacy Technicians	Tier 1	Pharmacy Aides	Radiologic Technologists/Techs	Tier 3
General Office Clerk	Production, Planning, & Expediting Clerks	Tier 2	Physical Therapist Aides	Licensed Practical & Vocational Nurses	Tier 2
General Office Clerk	Project Management Specialists	Tier 3	Physical Therapist Aides	Physical Therapist Assistants	Tier 2
Helpers, Electricians	Avionics Technicians	Tier 2	Protective Service Workers, MISC	Paralegals & Legal Assistants	Tier 1
Helpers, Electricians	Electrical Power & Industrial Systems Tech	Tier 2	Protective Service Workers, MISC	Police & Sheriffs Patrol Officers	Tier 2
Helpers, Electricians	Electricians	Tier 2	Recreational Vehicle Service Techs	Aircraft Mechanics & Service Technicians	Tier 3
Helpers, Electricians	Industrial Automation Technician	Tier 1	Recreational Vehicle Service Techs	Aircraft Structure, Rigging, & Systems Assemblers	Tier 3
Helpers, Electricians	Supervisors, Mechanics, Installers & Repairers	Tier 3	Recreational Vehicle Service Techs	Automotive Service Techs & Mechanics	Tier 1
Helpers, Installation, Maintenance & Repair	Electrical Power & Industrial Systems Tech	Tier 1	Recreational Vehicle Service Techs	Avionics Technicians	Tier 3
Helpers, Installation, Maintenance & Repair	Heating, A.C. & Refrigeration Mechanics/Techs	Tier 1	Recreational Vehicle Service Techs	Bus/Truck Mechanics & Diesel Engine Specialists	Tier 2
Helpers, Installation, Maintenance & Repair	Industrial Machinery Mechanics	Tier 2	Recreational Vehicle Service Techs	Heating, A.C. & Refrigeration Mechanics/Techs	Tier 1
Helpers, Installation, Maintenance & Repair	Supervisors, Mechanics, Installers & Repairers	Tier 3	Recreational Vehicle Service Techs	Mobile Heavy Equipment Mechanics, ex. Engines	Tier 2
Helpers, Production Workers	Aircraft Structure, Rigging, & Systems Assemblers	Tier 2	Recreational Vehicle Service Techs	Supervisors, Mechanics, Installers & Repairers	Tier 3
Home Health Aides	Licensed Practical & Vocational Nurses	Tier 2	Retail Salespersons	Production, Planning, & Expediting Clerks	Tier 2
Home Health Aides	Physical Therapist Assistants	Tier 2	Retail Salespersons	Supervisors, Retail Sales Workers	Tier 1
Home Health Aides	Radiologic Technologists/Techs	Tier 3	Security Guards	Police & Sheriffs Patrol Officers	Tier 2
Home Health Aides	Registered Nurses	Tier 3	Stockers & Order Fillers	Bookkeeping, Accounting, & Auditing Clerks	Tier 2
Home Health Aides	Respiratory Therapists	Tier 3	Stockers & Order Fillers	Heavy Tractor-Trailer Truck Drivers	Tier 3
Hotel, Motel & Resort Desk Clerks	Bookkeeping, Accounting, & Auditing Clerks	Tier 2	Stockers & Order Fillers	Production, Planning, & Expediting Clerks	Tier 1
Installation, Maintenance & Repair Workers, MISC	Aircraft Mechanics & Service Technicians	Tier 2	Supervisors, Personal Service Workers	Food Service Managers	Tier 2
Installation, Maintenance & Repair Workers, MISC	Avionics Technicians	Tier 3	Supervisors, Personal Service Workers	Supervisors, Retail Sales Workers	Tier 1
Installation, Maintenance & Repair Workers, MISC	Electrical Power & Industrial Systems Tech	Tier 2	Team Assemblers	Aircraft Structure, Rigging, & Systems Assemblers	Tier 2
Installation, Maintenance & Repair Workers, MISC	Heating, A.C. & Refrigeration Mechanics/Techs	Tier 1	Team Assemblers	Industrial Machinery Mechanics	Tier 2
Installation, Maintenance & Repair Workers, MISC	Industrial Machinery Mechanics	Tier 2	Team Assemblers	Supervisors, Mechanics, Installers & Repairers	Tier 3
Installation, Maintenance & Repair Workers, MISC	Mobile Heavy Equipment Mechanics, ex. Engines	Tier 1	Team Assemblers	Supervisors, Production & Operating Workers	Tier 2
Installation, Maintenance & Repair Workers, MISC	PLC Technician	Tier 2	Team Assemblers	Welders, Cutters, Solderers & Brazers	Tier 2
Installation, Maintenance & Repair Workers, MISC	Supervisors, Mechanics, Installers & Repairers	Tier 3	Tire Repairers & Changers	Automotive Service Techs & Mechanics	Tier 2
Maintenance & Repair Workers, General	Aircraft Mechanics & Service Technicians	Tier 3	Tire Repairers & Changers	Bus/Truck Mechanics & Diesel Engine Specialists	Tier 3
Maintenance & Repair Workers, General	Electrical Power & Industrial Systems Tech	Tier 3	Tire Repairers & Changers	Industrial Automation Technician	Tier 3
Maintenance & Repair Workers, General	Heating, A.C. & Refrigeration Mechanics/Techs	Tier 1	Tire Repairers & Changers	Industrial Machinery Mechanics	Tier 1
Maintenance & Repair Workers, General	Industrial Automation Technician	Tier 2	Tire Repairers & Changers	Mobile Heavy Equipment Mechanics, ex. Engines	Tier 2
Maintenance & Repair Workers, General	Industrial Machinery Mechanics	Tier 1	Tire Repairers & Changers	PLC Technician	Tier 2
Maintenance & Repair Workers, General	Mobile Heavy Equipment Mechanics, ex. Engines	Tier 2	Tire Repairers & Changers	Supervisors, Mechanics, Installers & Repairers	Tier 3
Maintenance & Repair Workers, General	Supervisors, Mechanics, Installers & Repairers	Tier 3			

The table above lists each lattice based on the Anchor occupational title. It also shows all Target Occupations that fall in each lattice and the tier in which it can be found. Some Target Occupations can be found on several lattices (such as Supervisors, Mechanics, Installers & Repairers), while others (such as Dental Hygienist) are limited to only one. This happens because some occupations have a higher percentage of transferable skills within and among the subset of the HOT job market from which Target Occupations were selected. Moreover, these Target Occupations are highly concentrated in the dominant and expanding manufacturing, health care, and trade industry sectors in the Heart of Texas region. Because each industry sector shares a common sub-knowledge foundation, it makes sense that there would be more overlap across multiple lattices for some occupations and not others based on commonality within an industry[31].

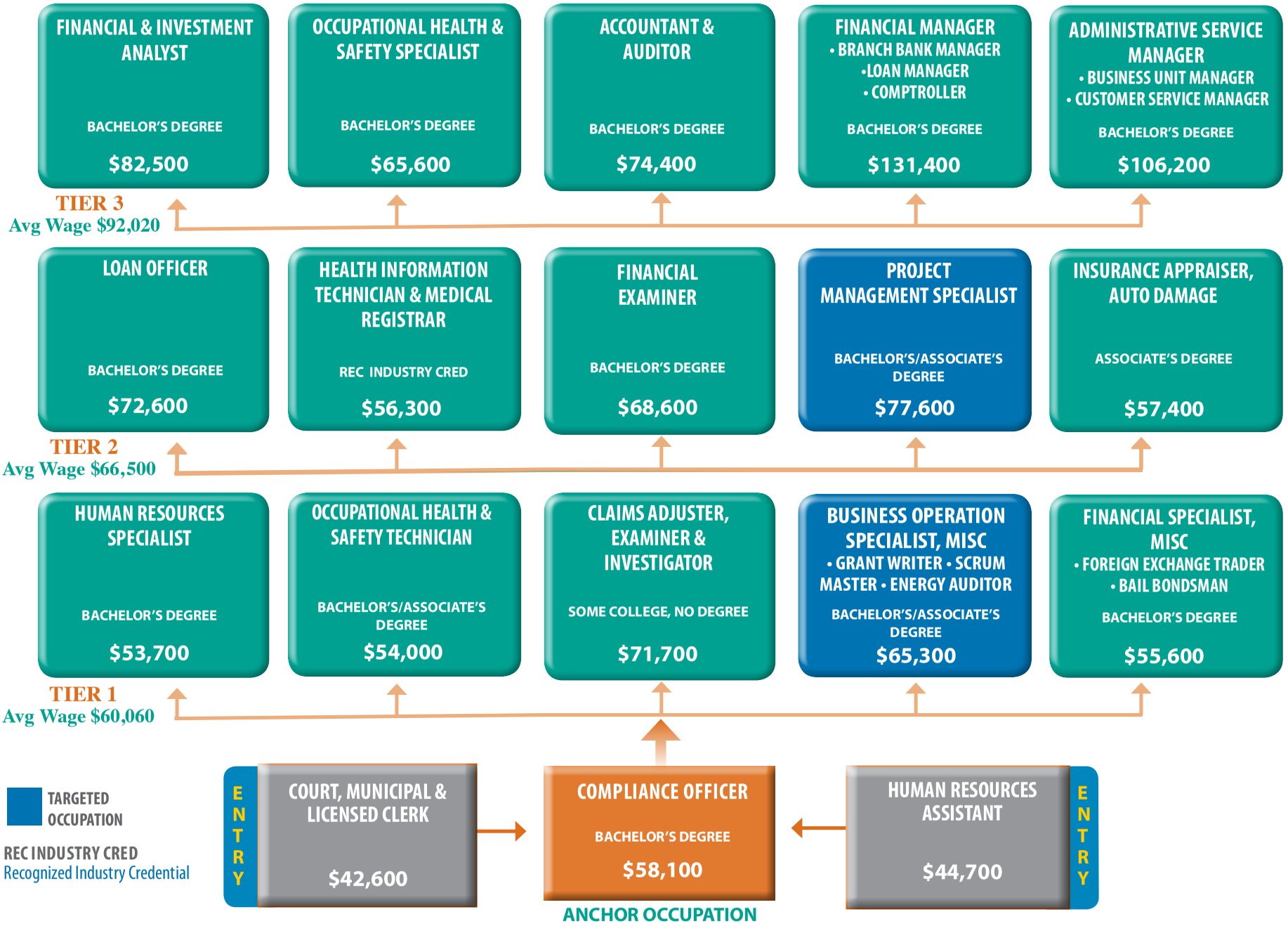
[31] The sub-knowledge domain has a significant influence on the selection algorithm defining similar occupations. The use of the SkillsEngine sub-knowledge domain and the cosine similarity technique were new and welcome additions to the process of building the career lattices.

1 ASSEMBLER & FABRICATOR, MISCELLANEOUS

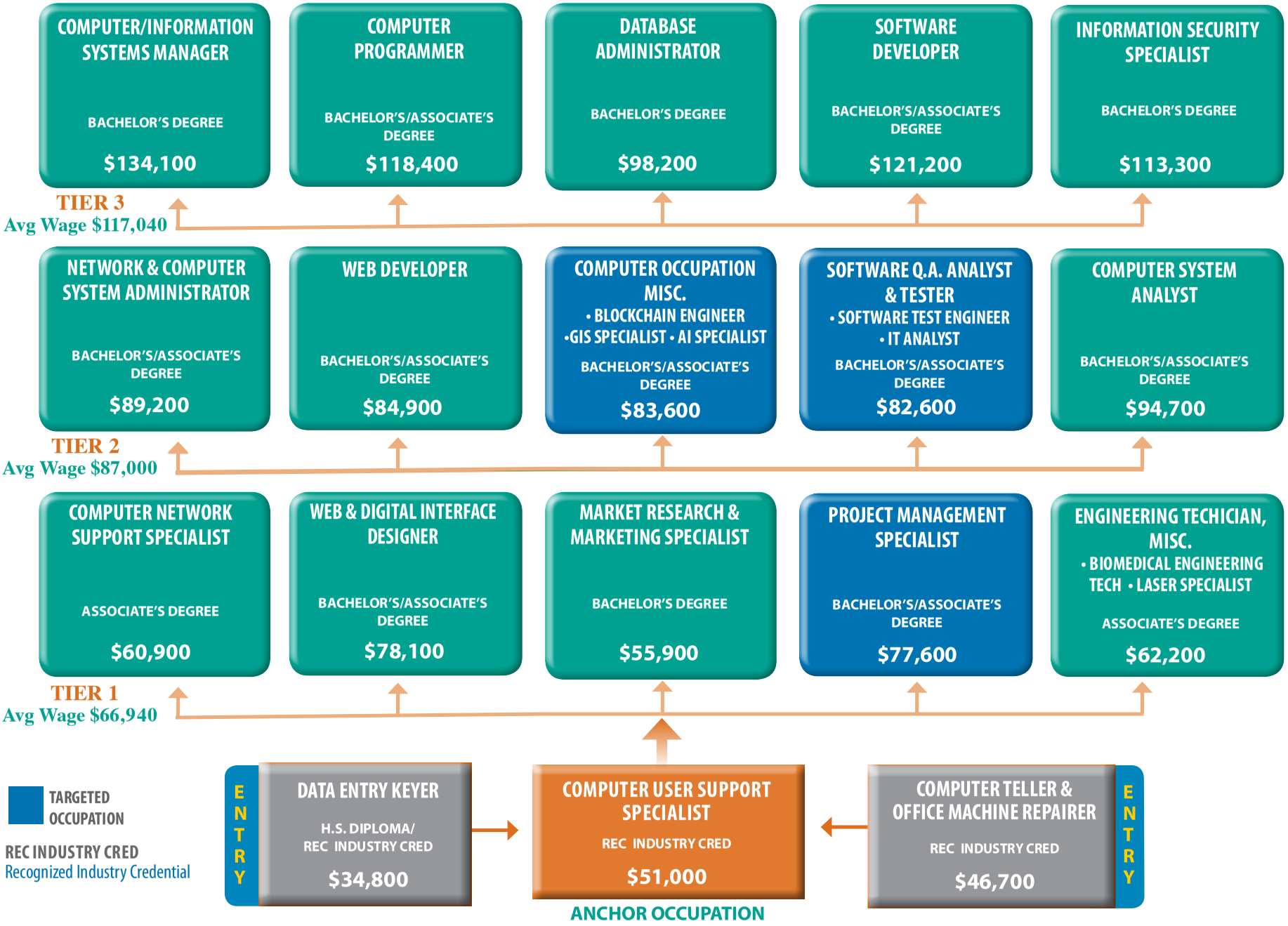


2 COMPLIANCE OFFICER

WORKFORCE SOLUTIONS HEART OF TEXAS

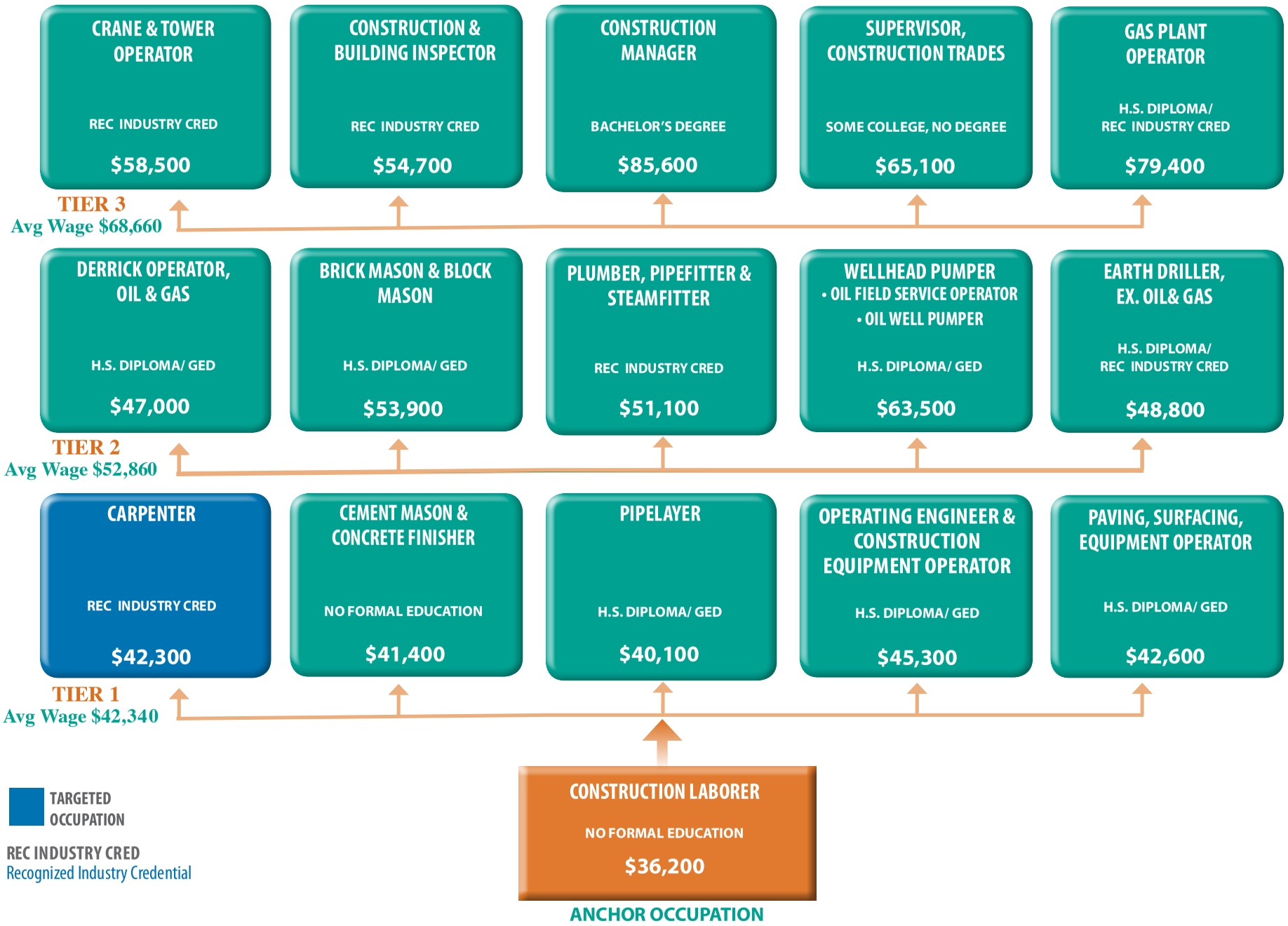


3 COMPUTER USER SUPPORT SPECIALIST

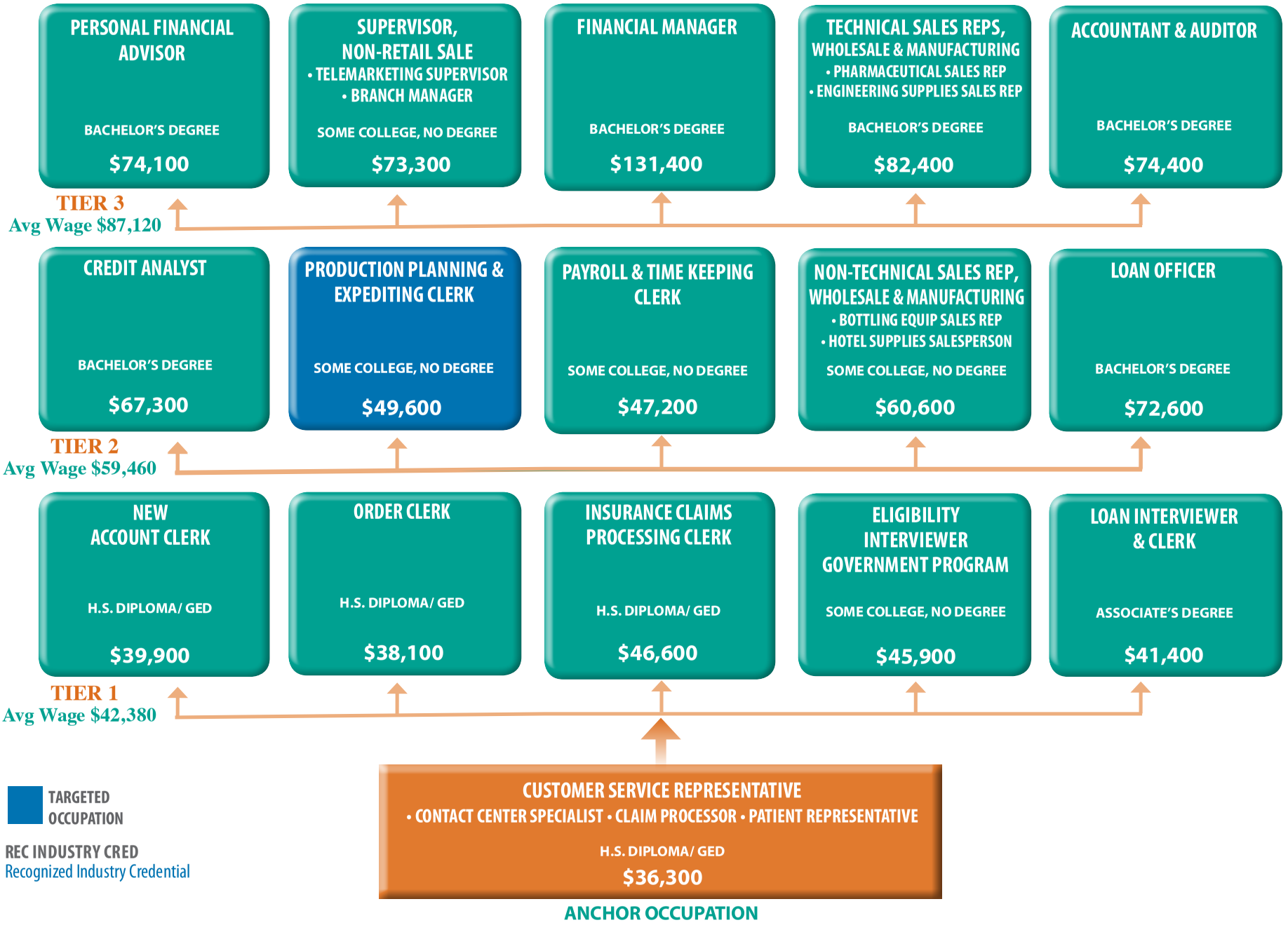


4 CONSTRUCTION LABORER

WORKFORCE SOLUTIONS HEART OF TEXAS



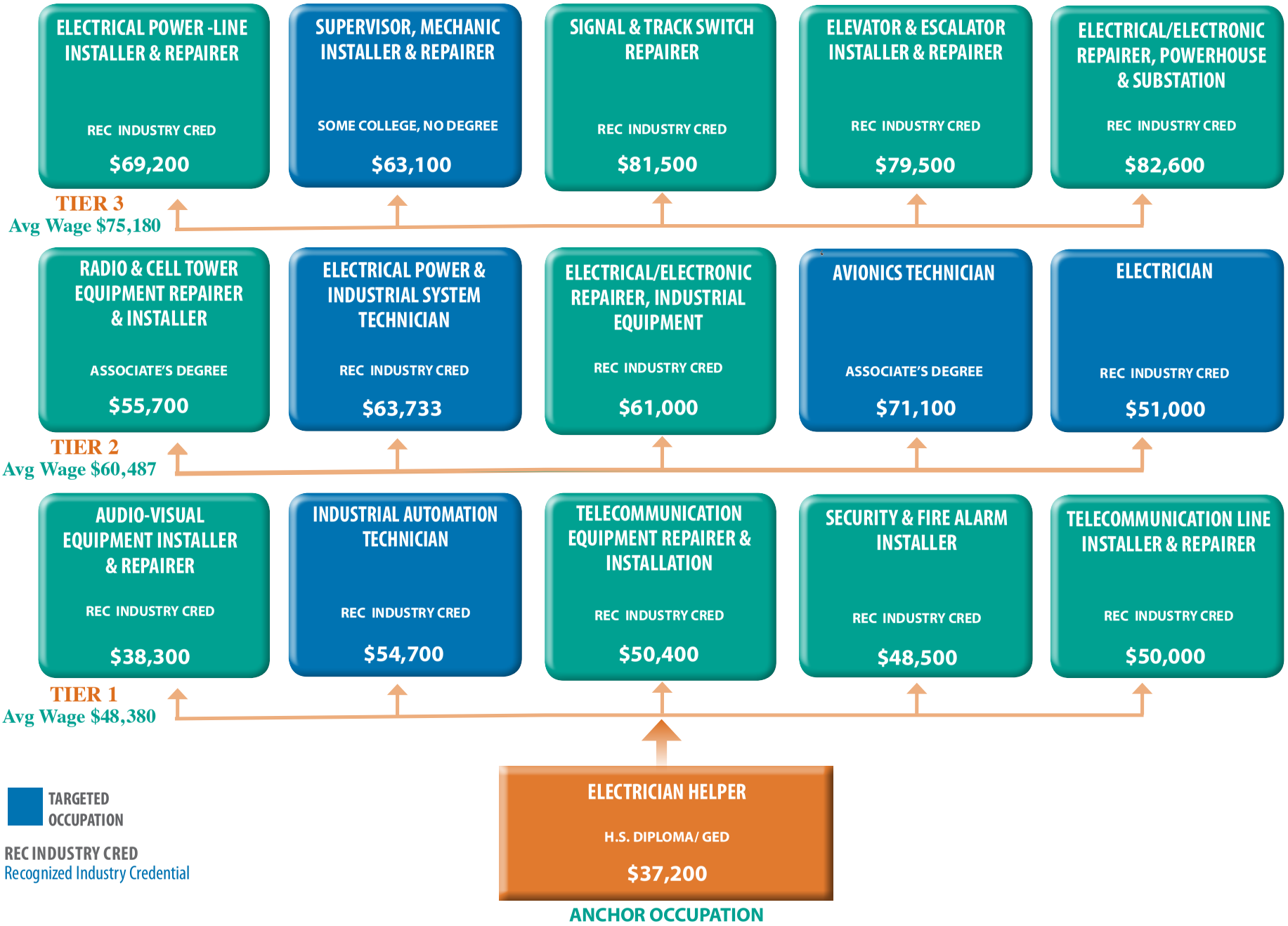
5 CUSTOMER SERVICE REPRESENTATIVE



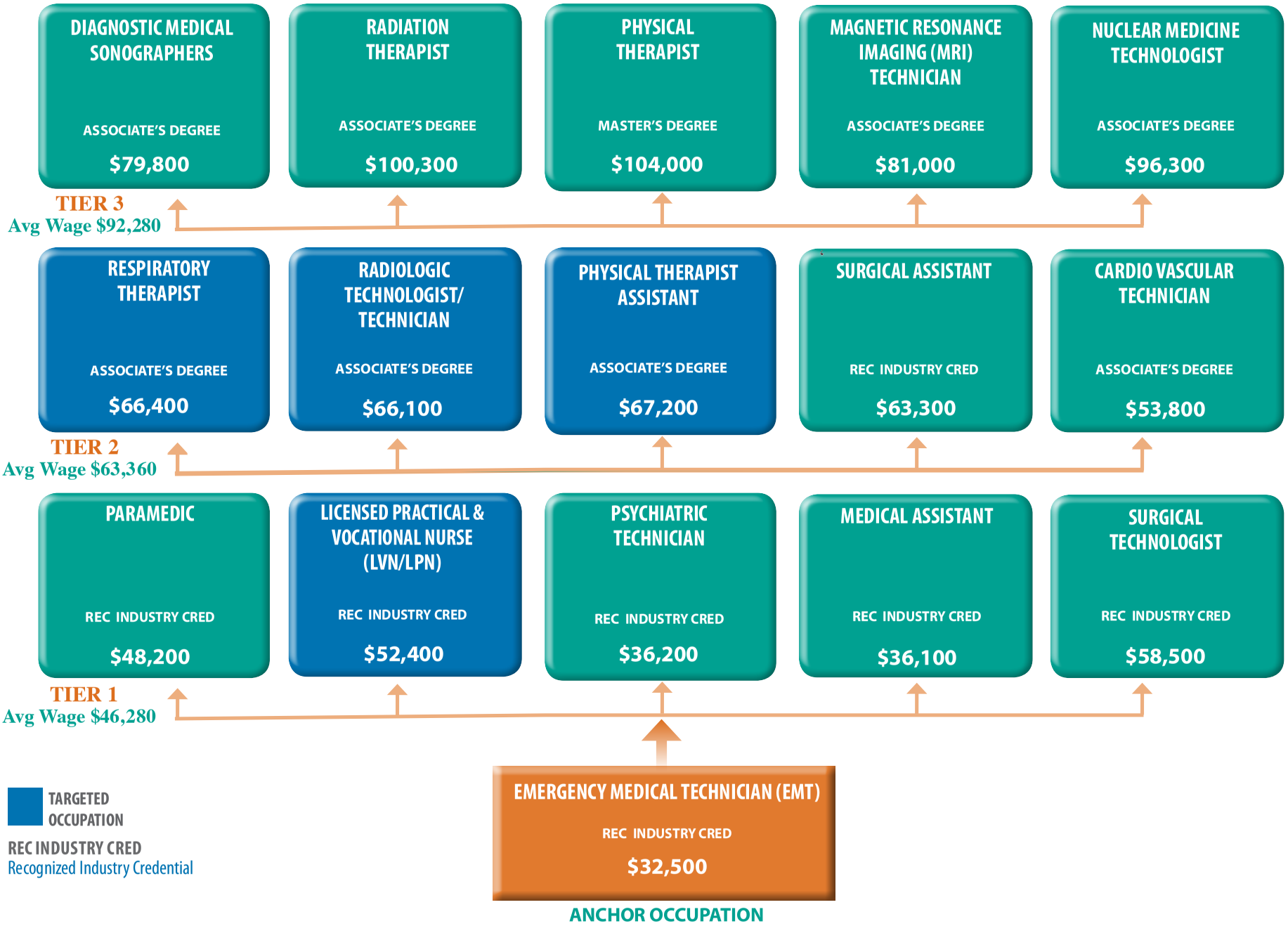
6

ELECTRICIAN HELPER

WORKFORCE SOLUTIONS HEART OF TEXAS

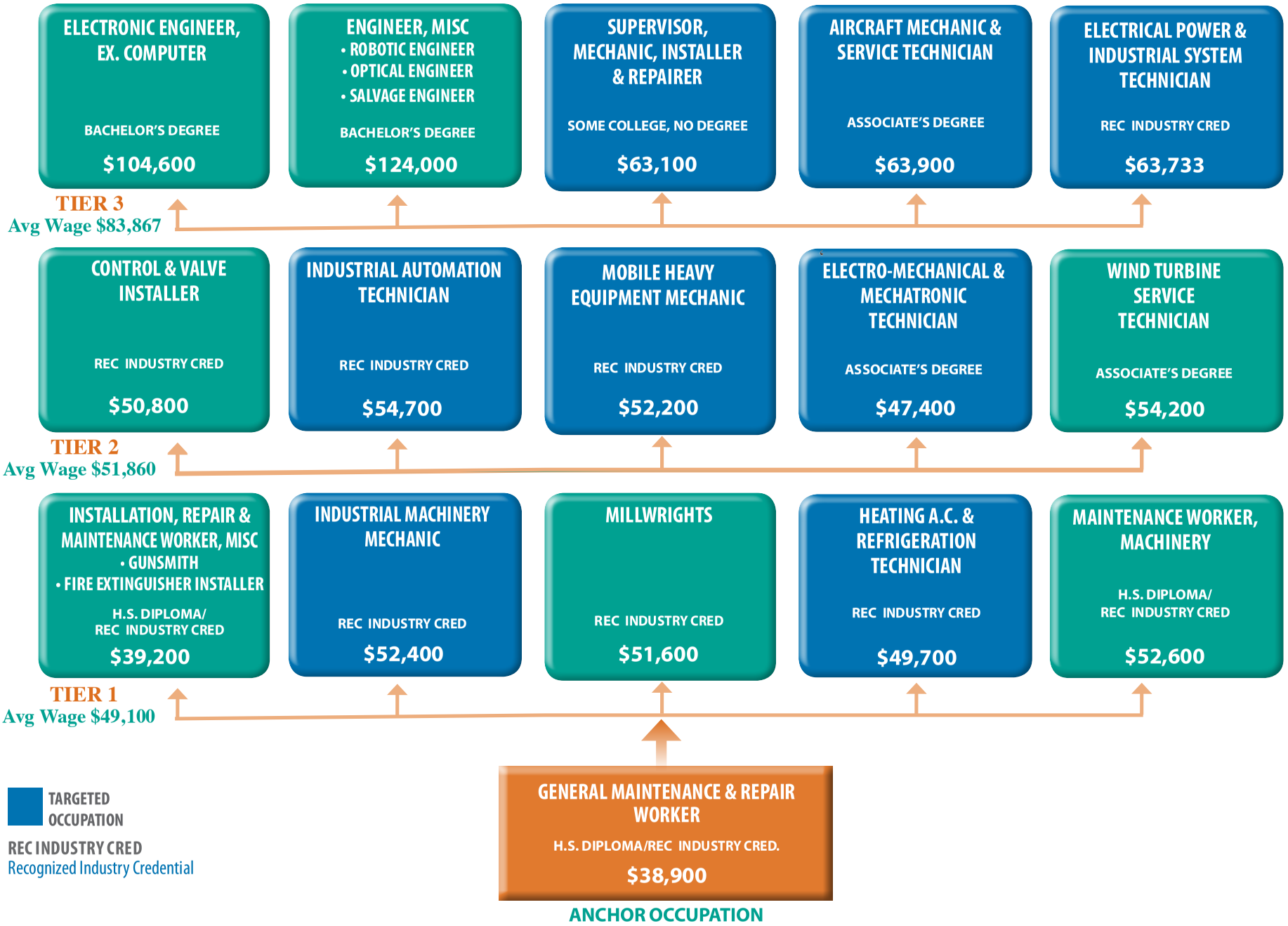


7 EMERGENCY MEDICAL TECHNICIAN (EMT)



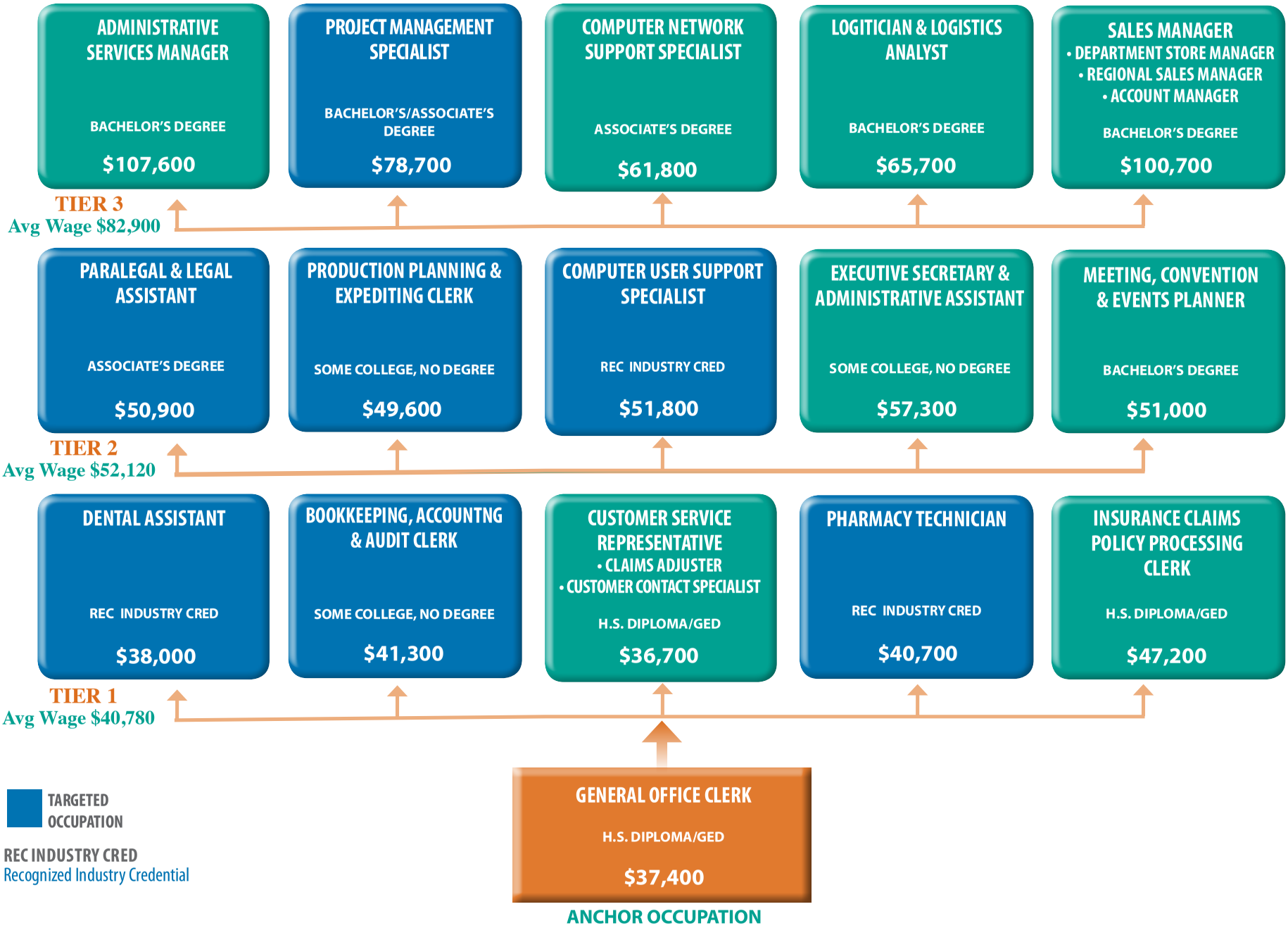
8 GENERAL MAINTENANCE & REPAIR WORKER

WORKFORCE SOLUTIONS HEART OF TEXAS
Linking Jobseekers and Employers



9 GENERAL OFFICE CLERK

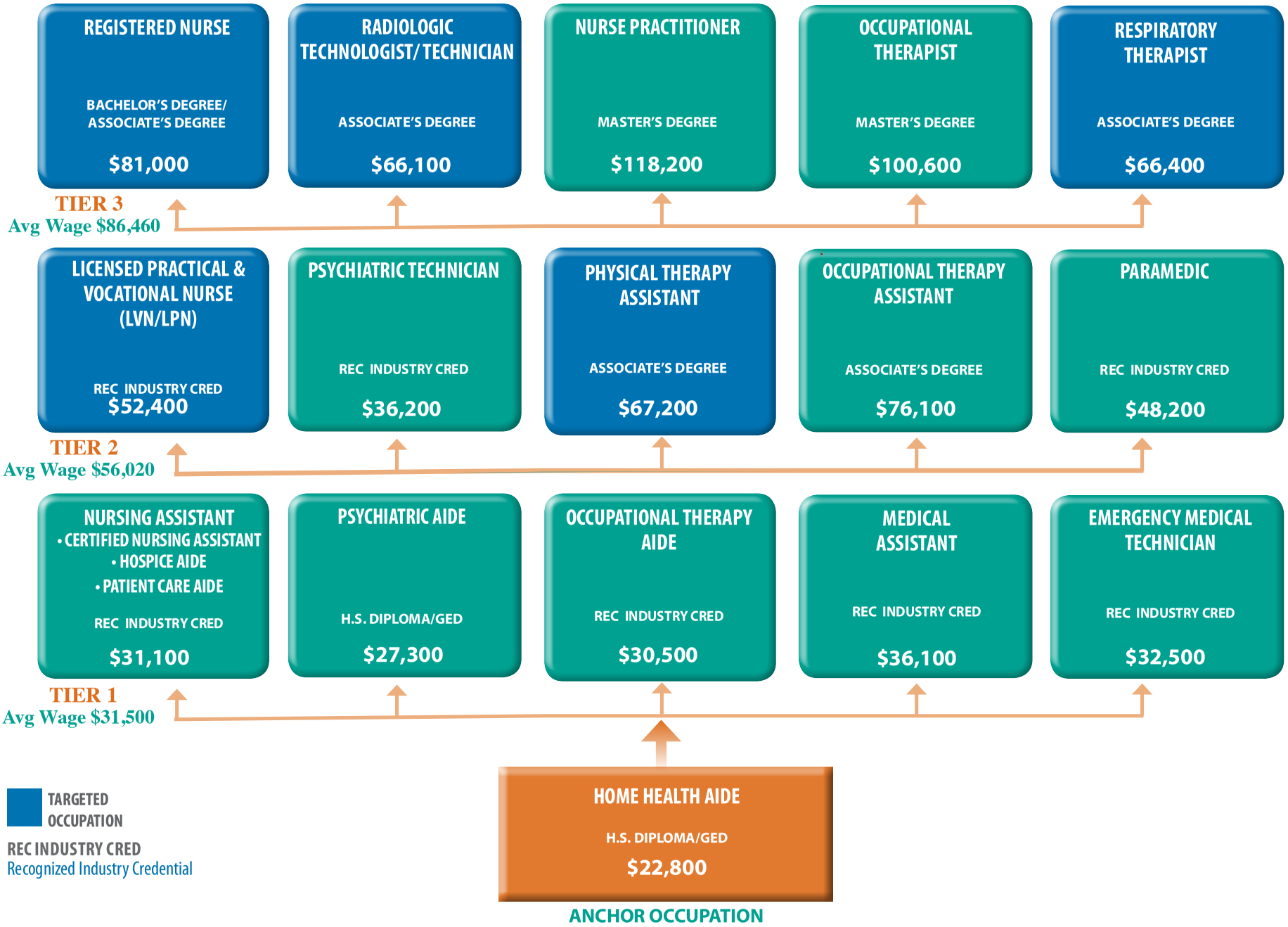
WORKFORCE SOLUTIONS HEART OF TEXAS



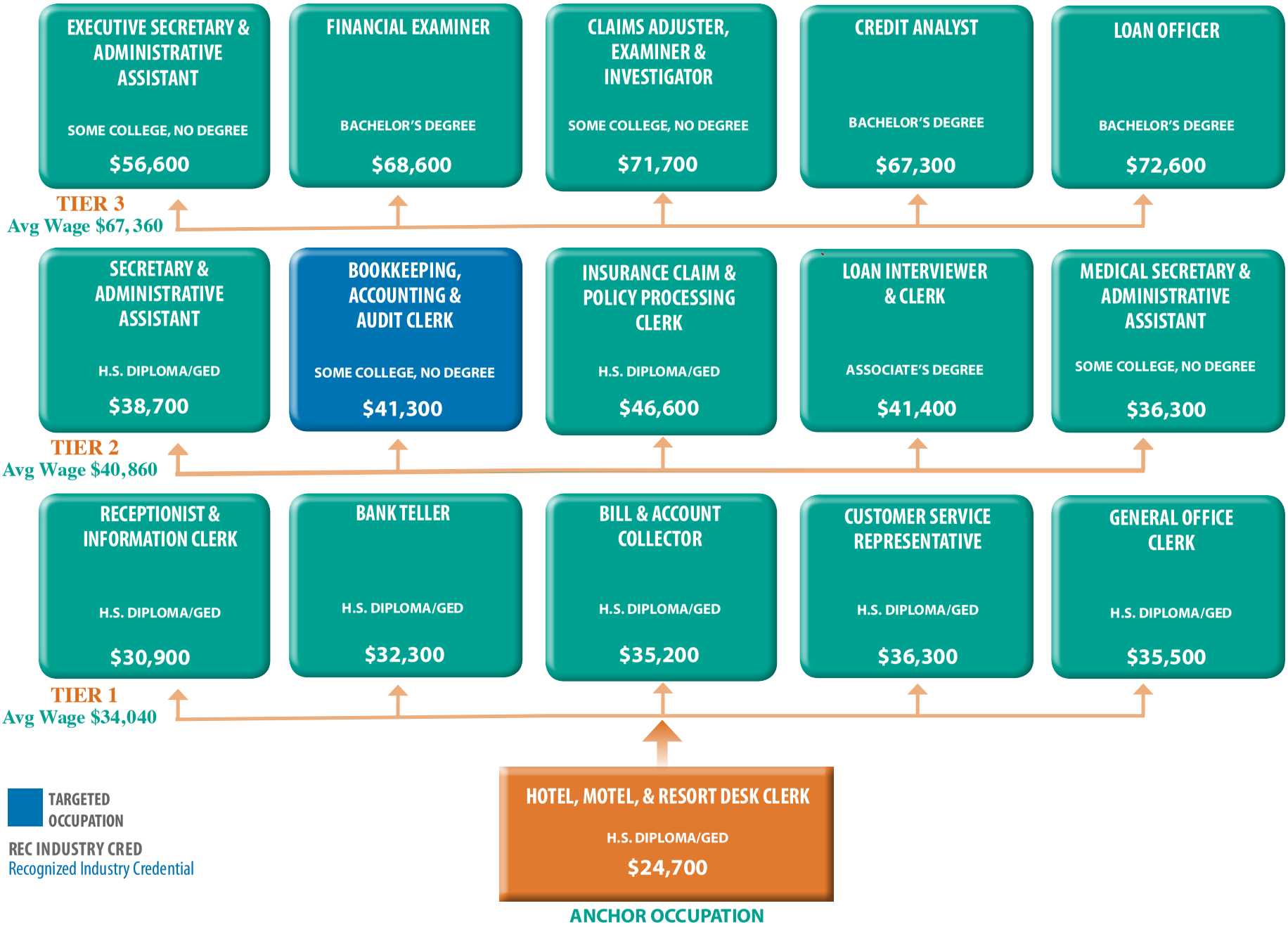
10

HOME HEALTH AIDE

WORKFORCE SOLUTIONS HEART OF TEXAS



HOTEL, MOTEL & RESORT DESK CLERK



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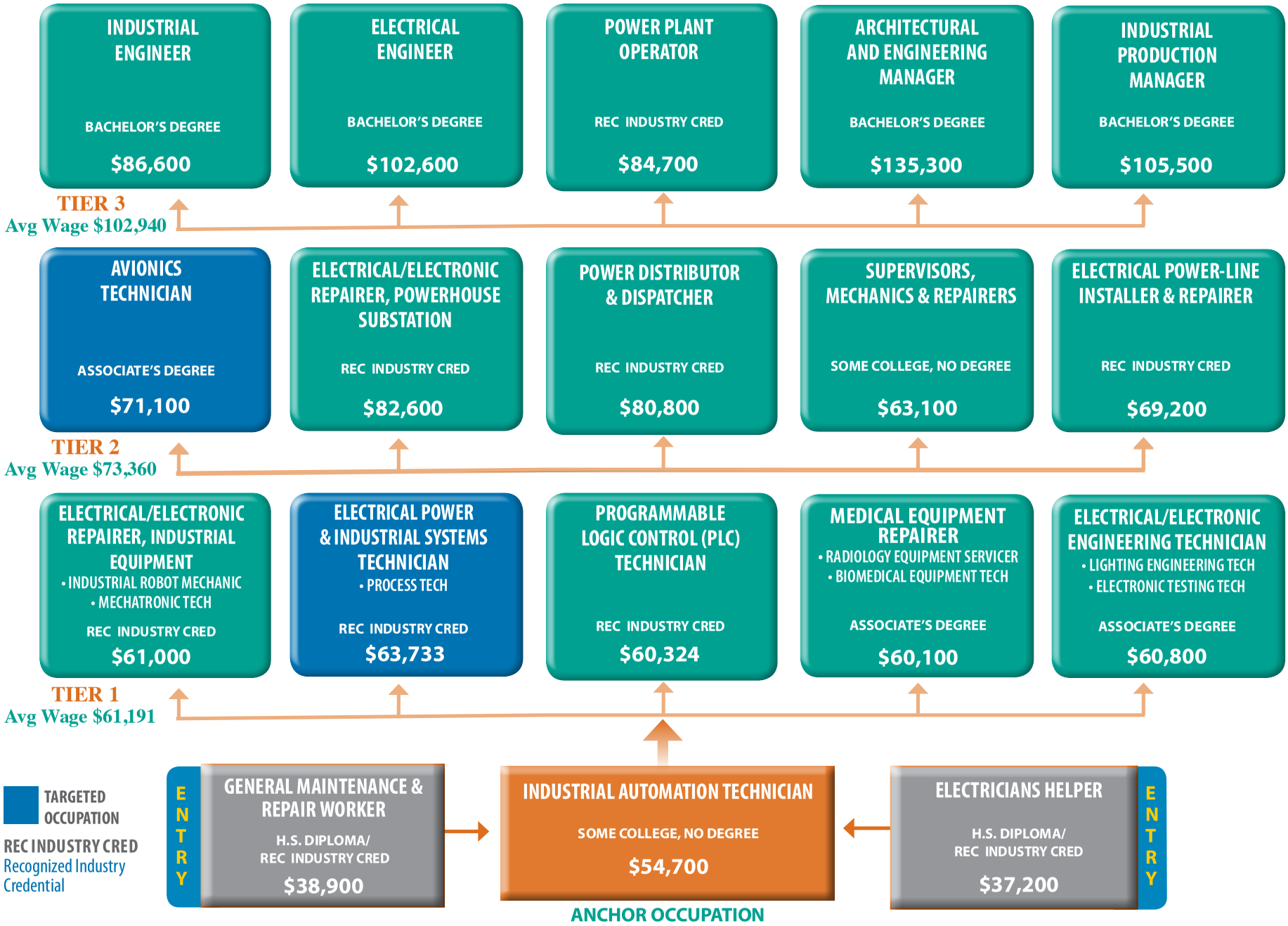

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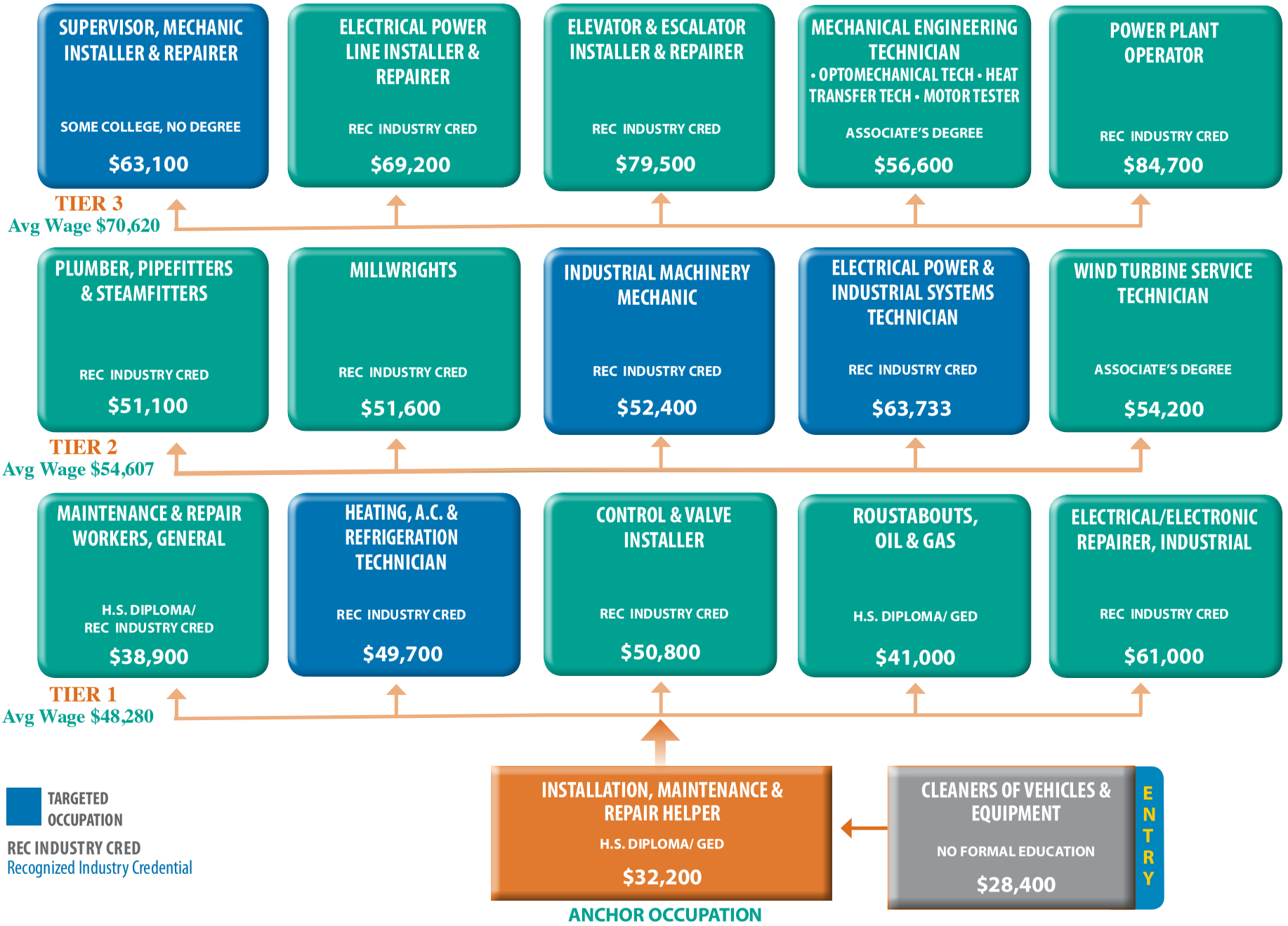

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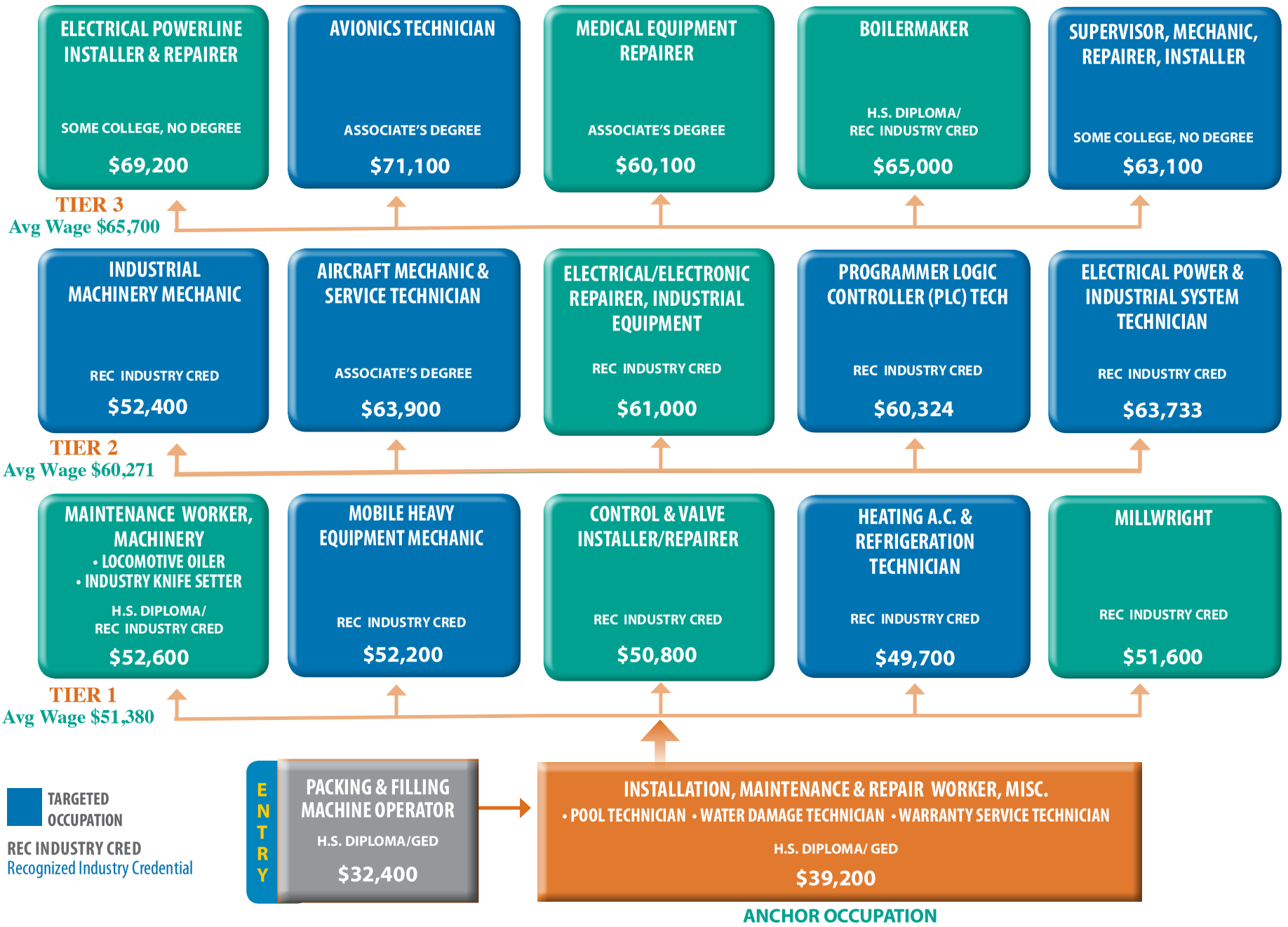

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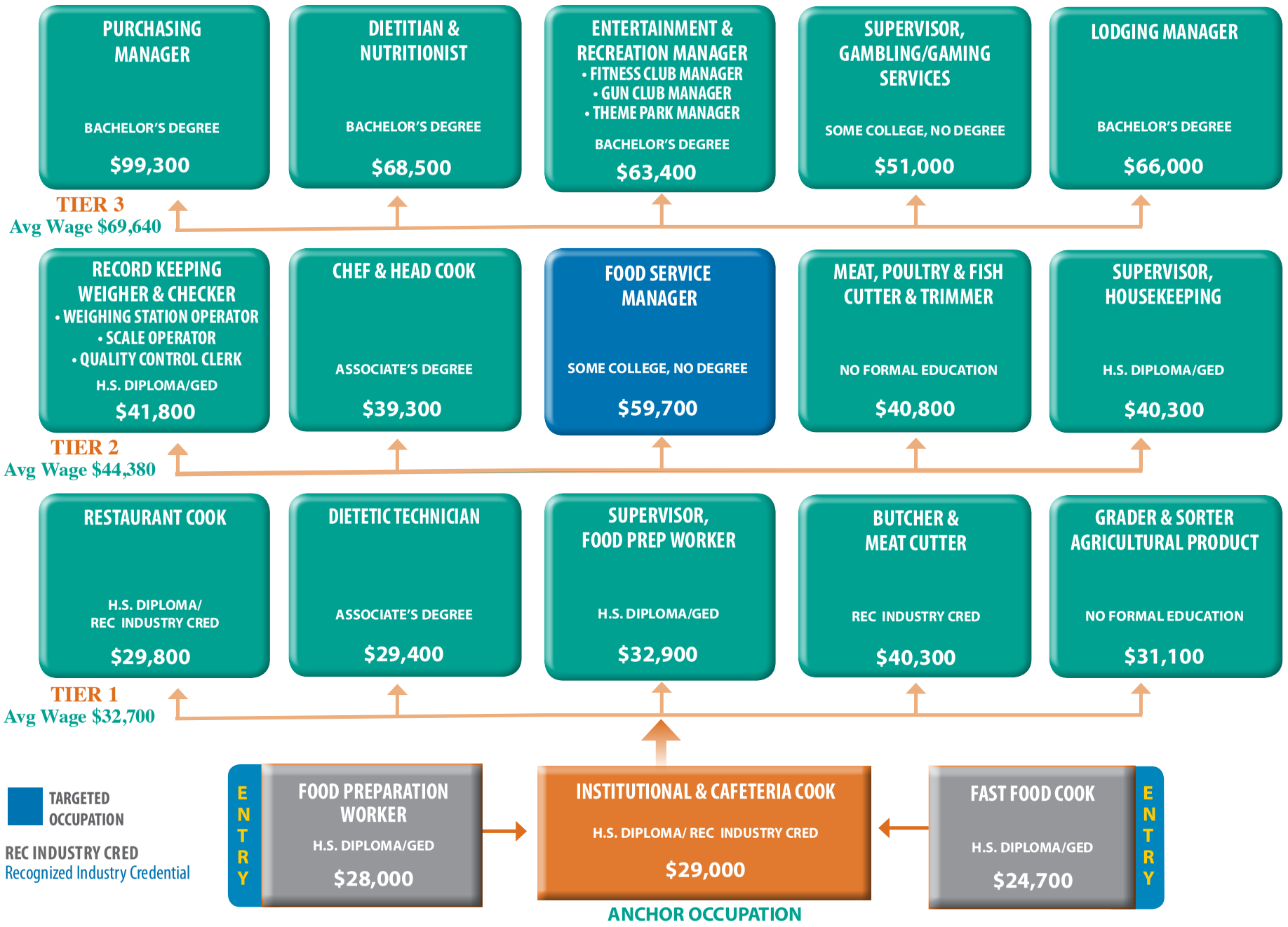

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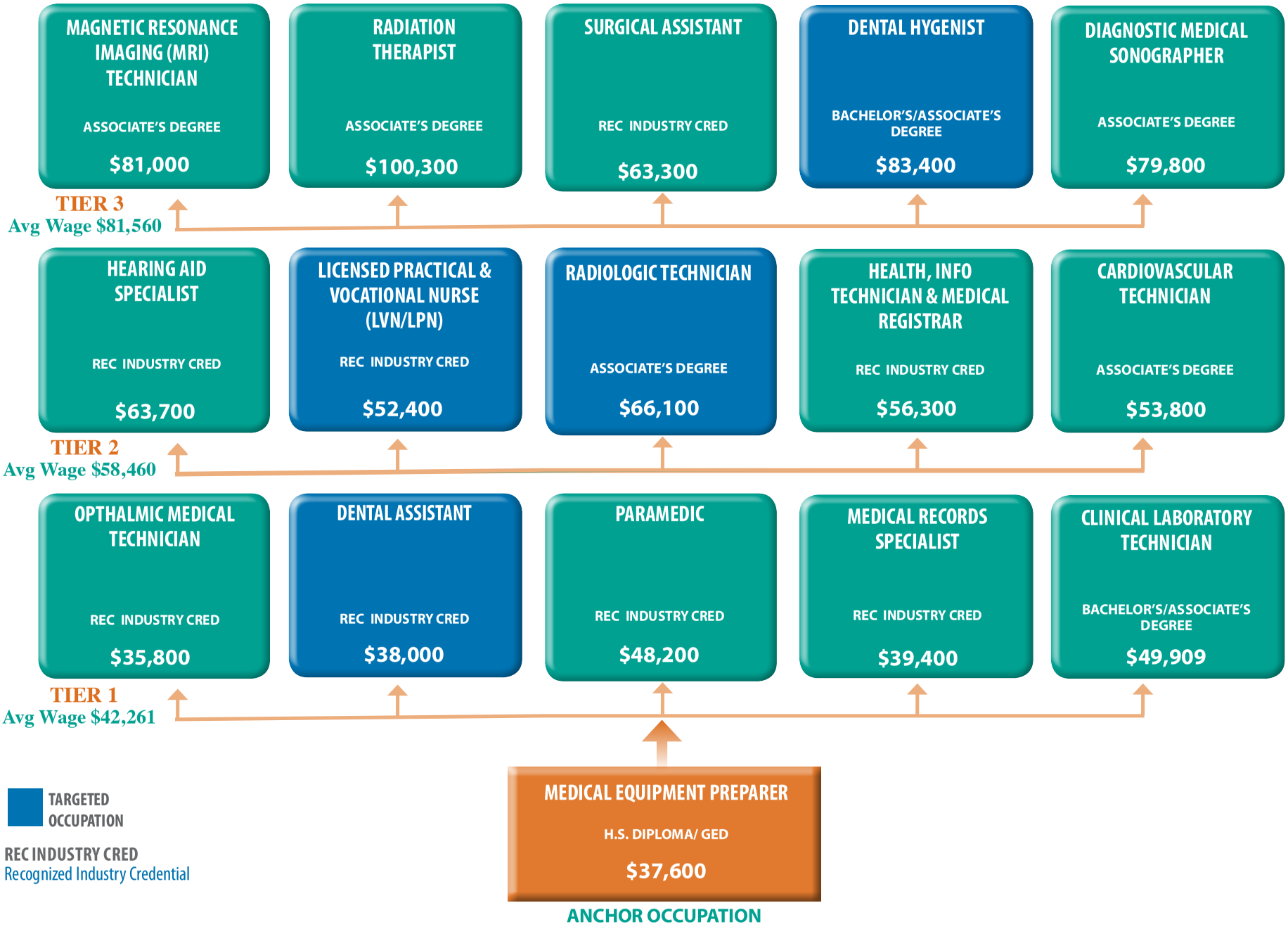

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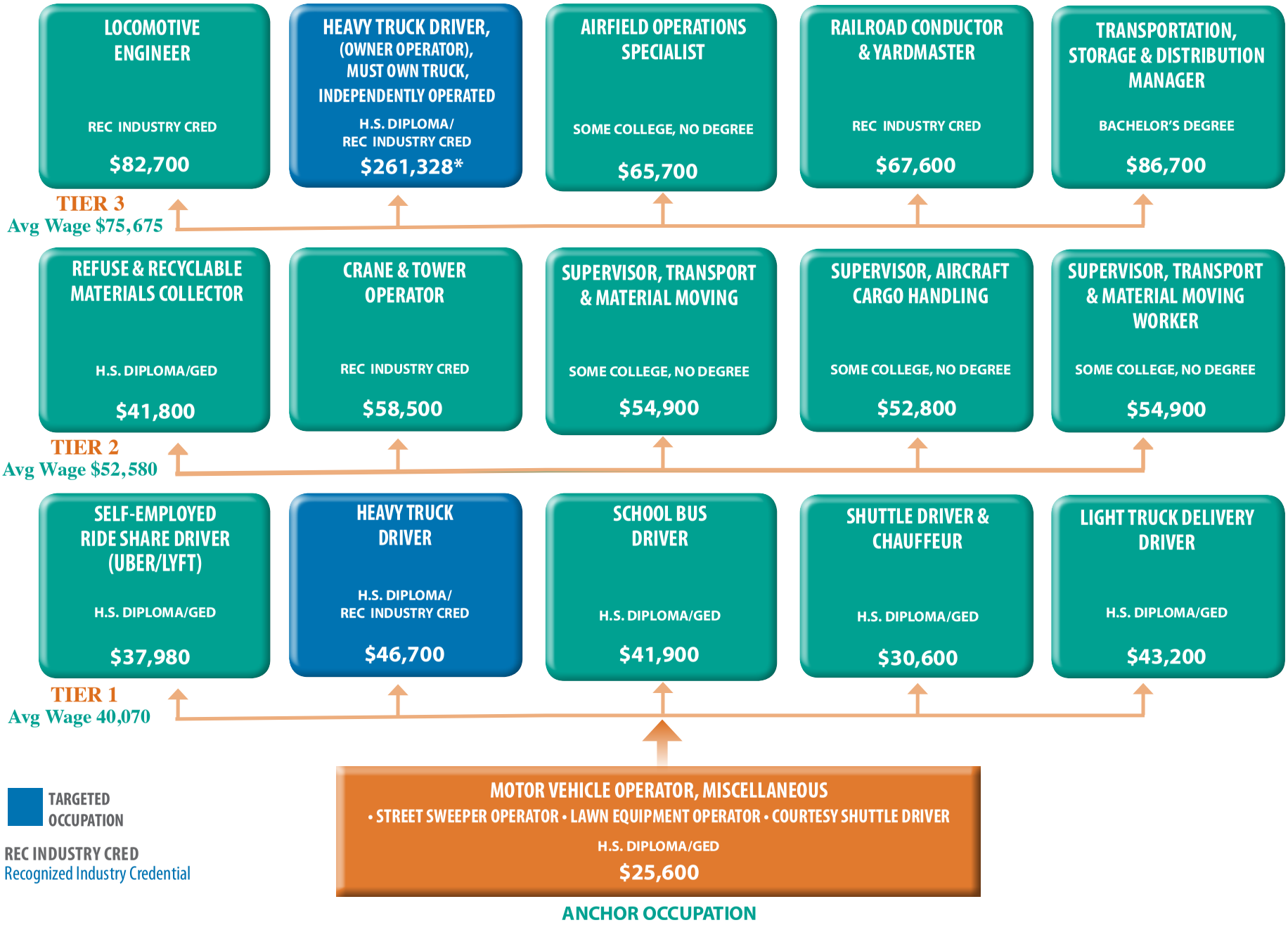

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MULTIPLE MACHINE TOOL OPERATOR

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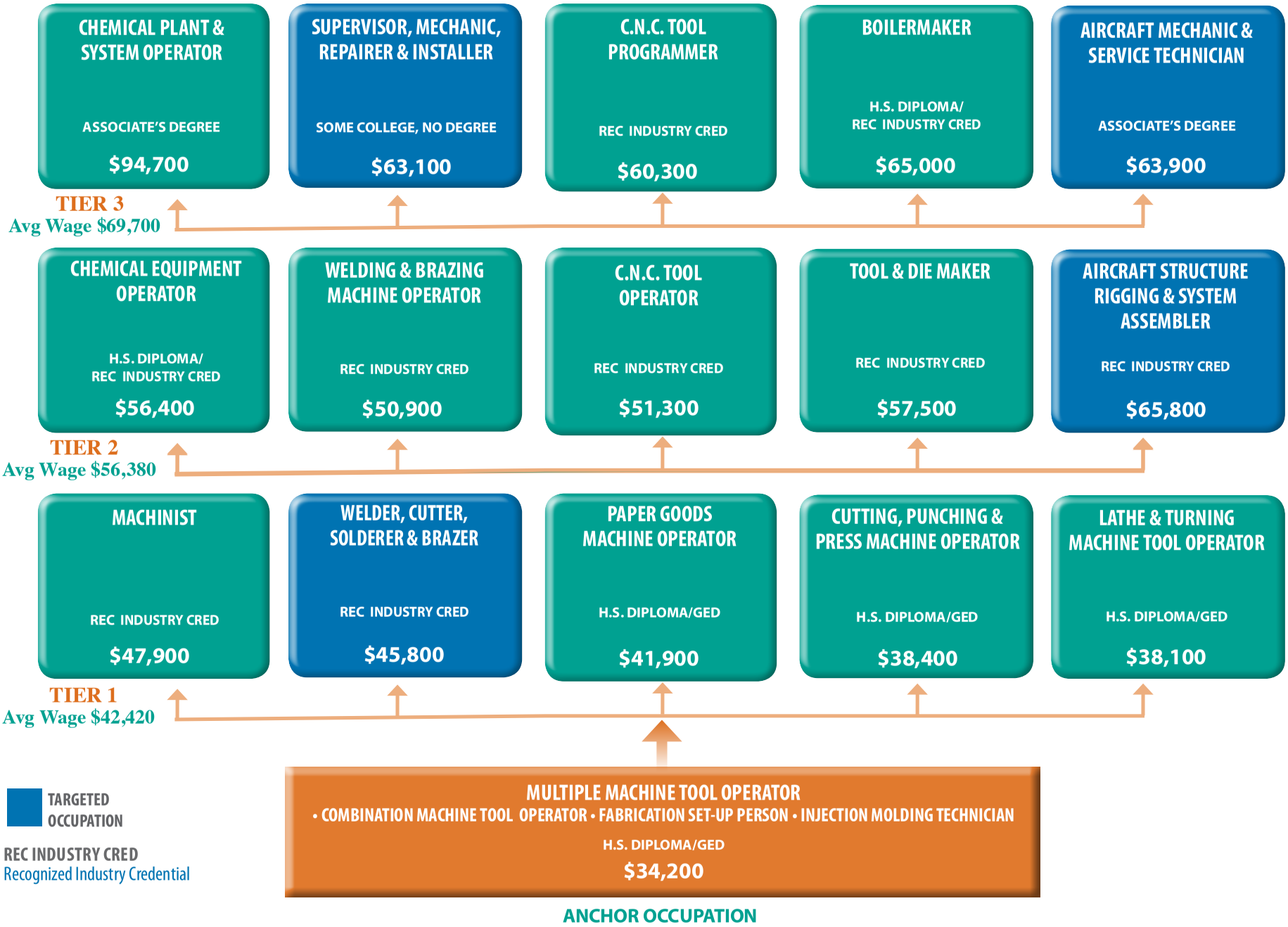

NURSING ASSISTANT

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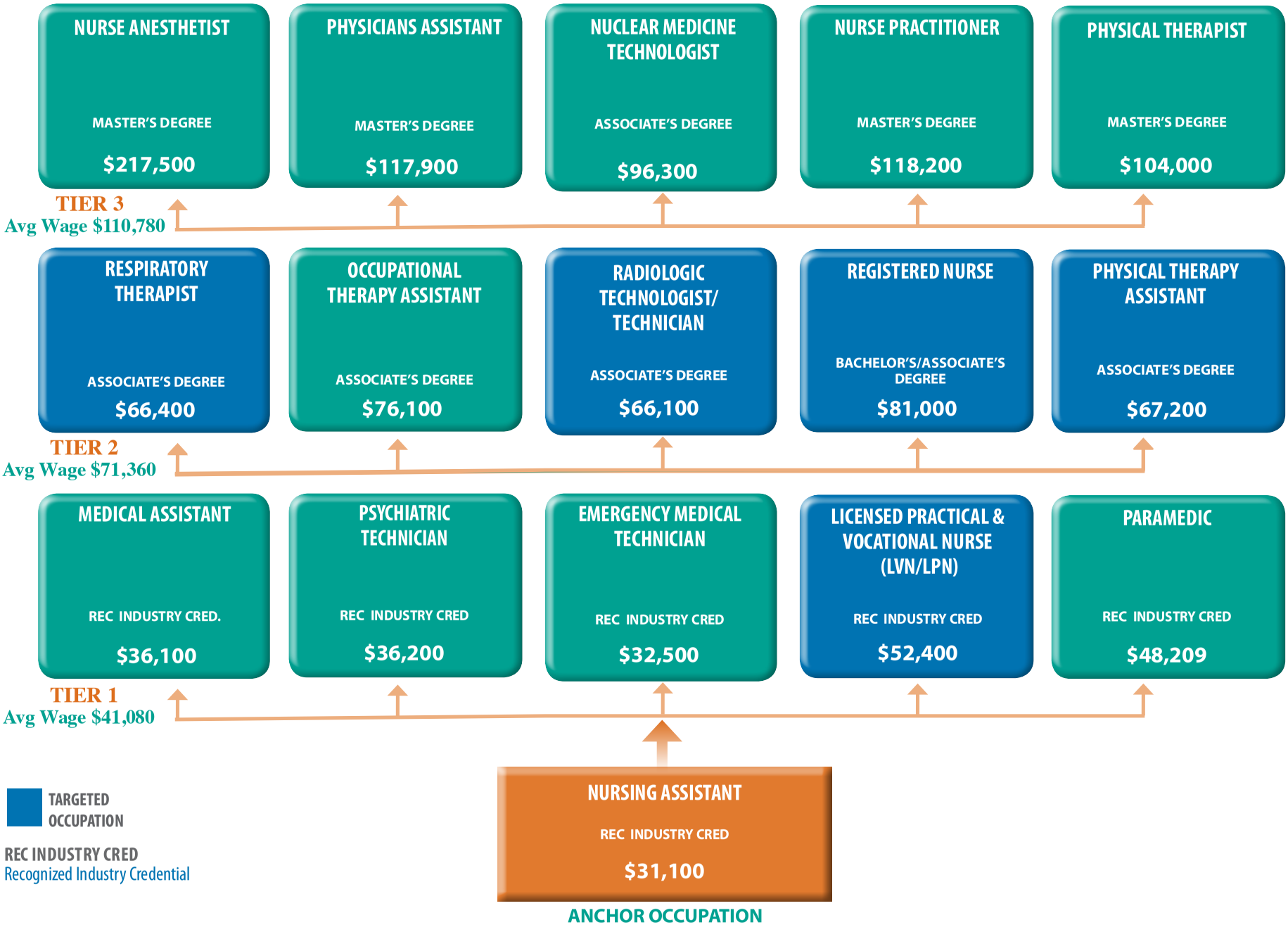

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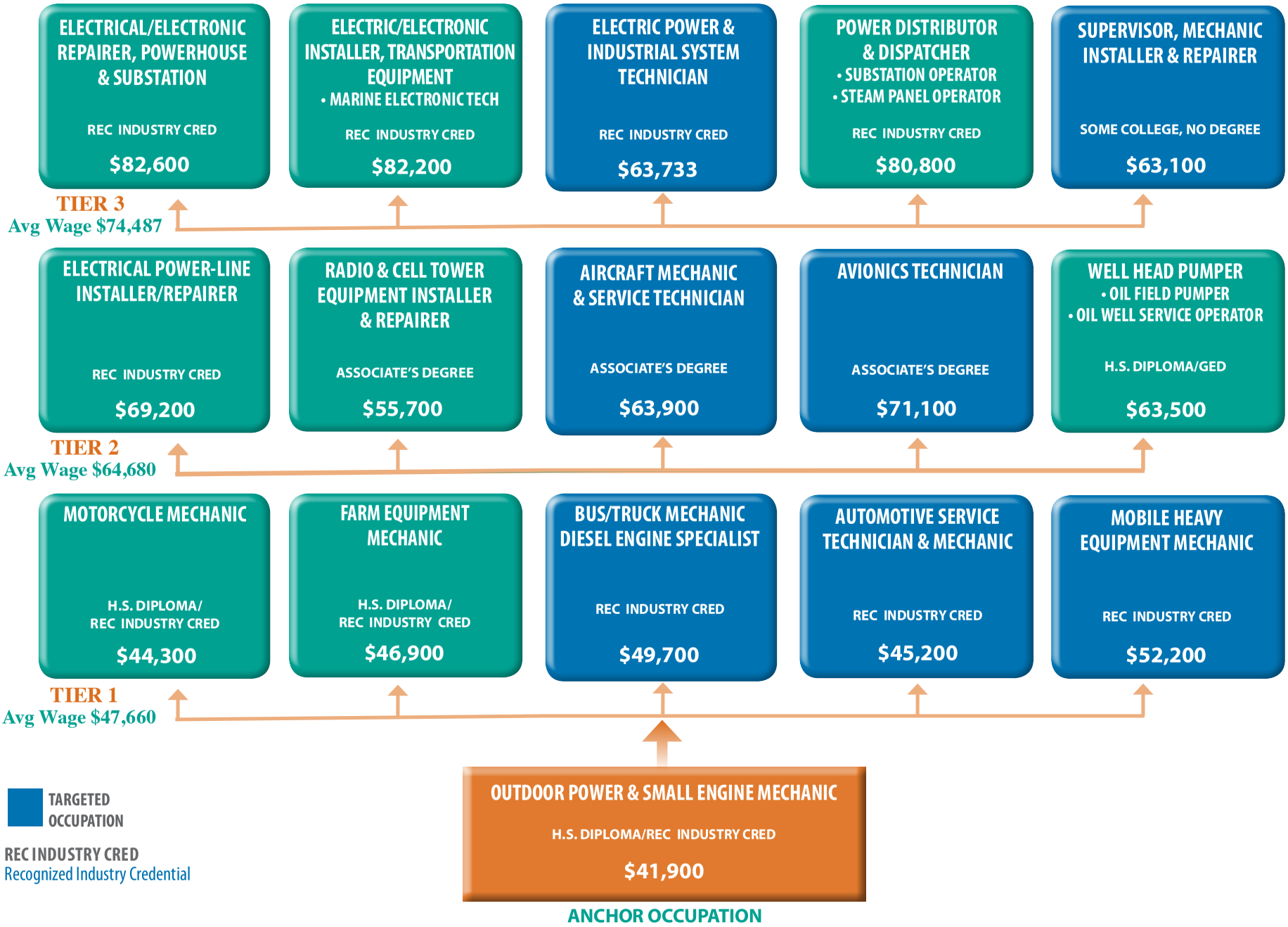
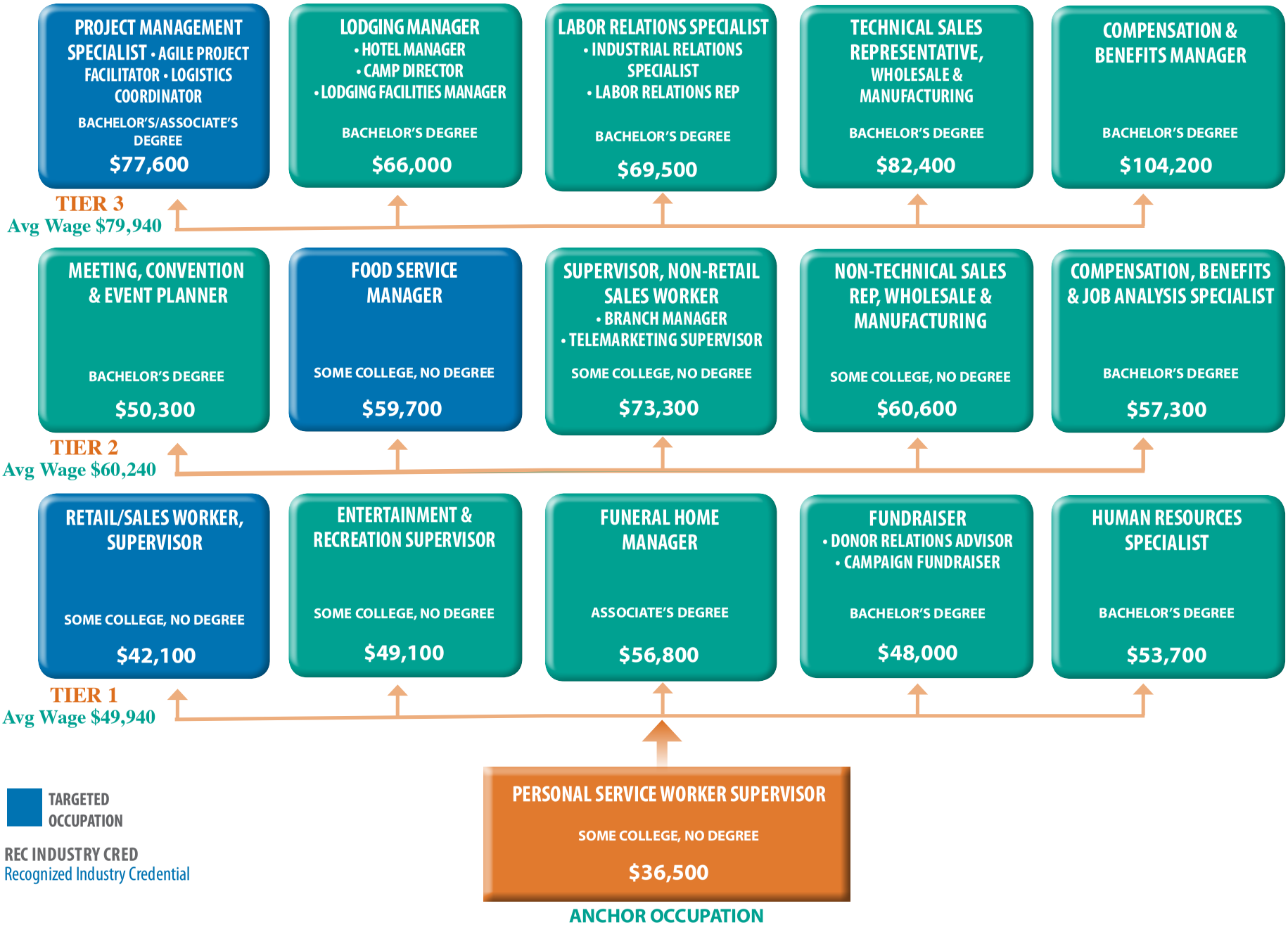


PERSONAL SERVICE WORKER SUPERVISOR



22

PHARMACY AIDE

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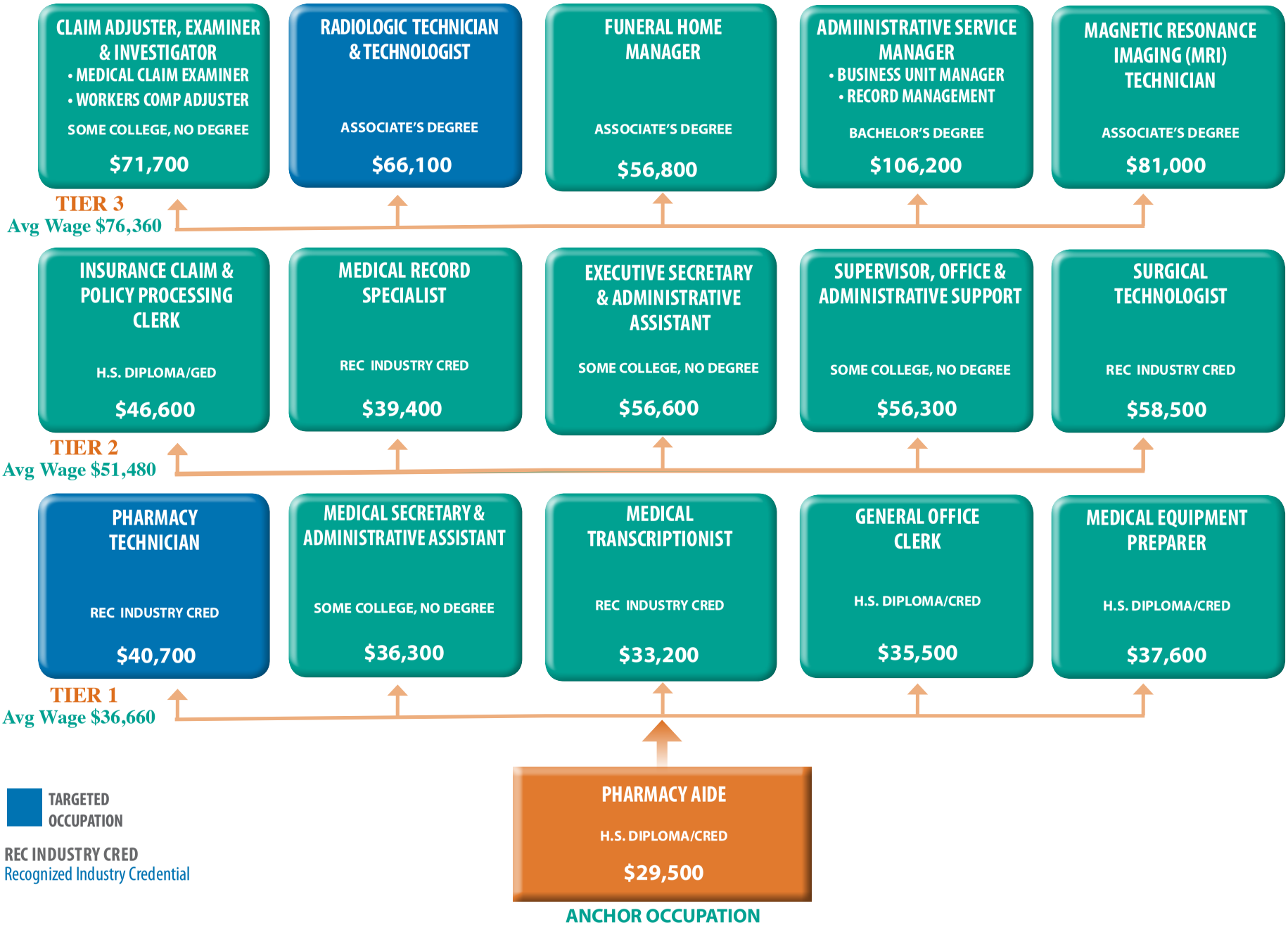

PHYSICAL THERAPIST AIDE

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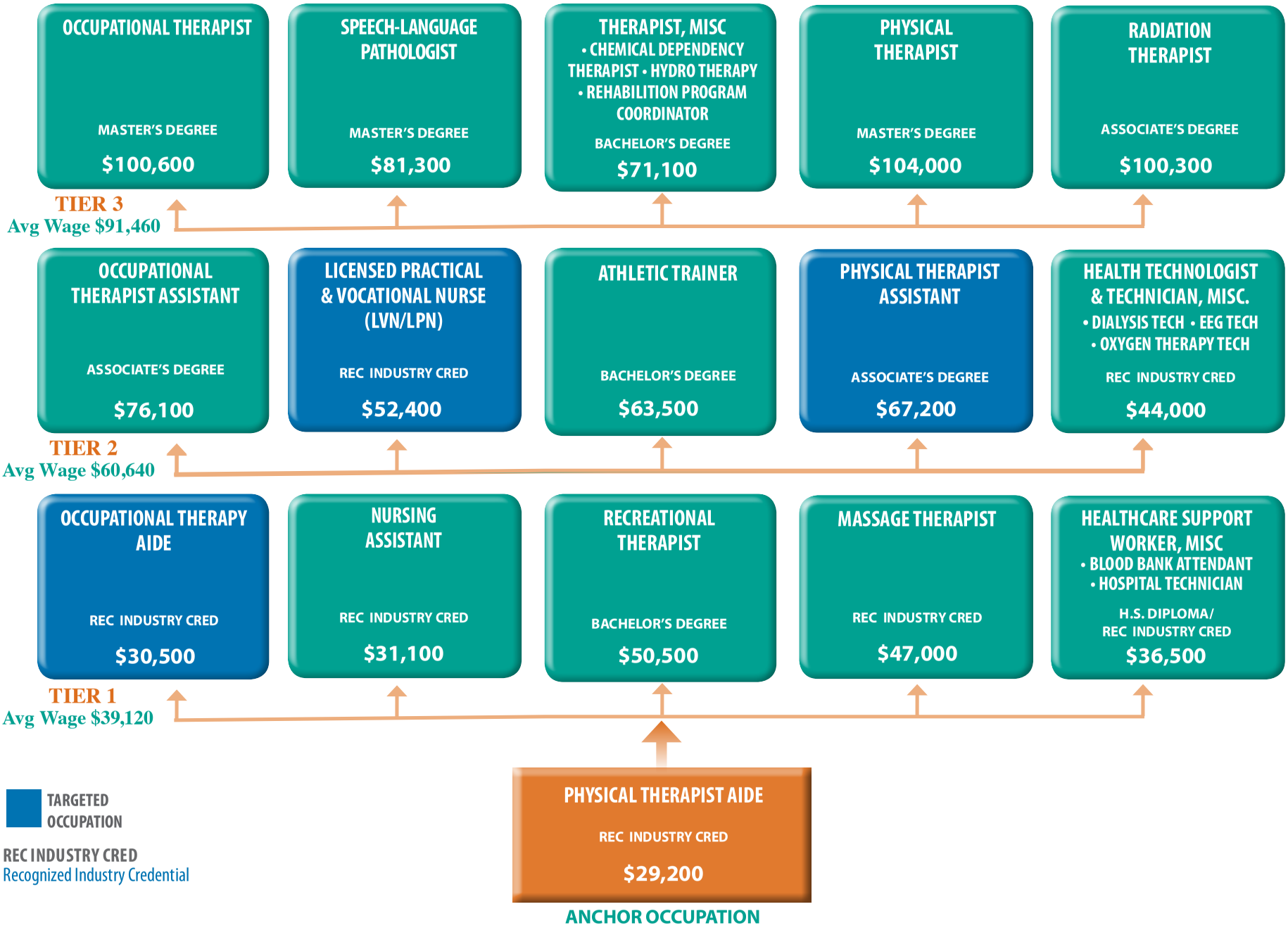

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PRODUCTION WORKER HELPER

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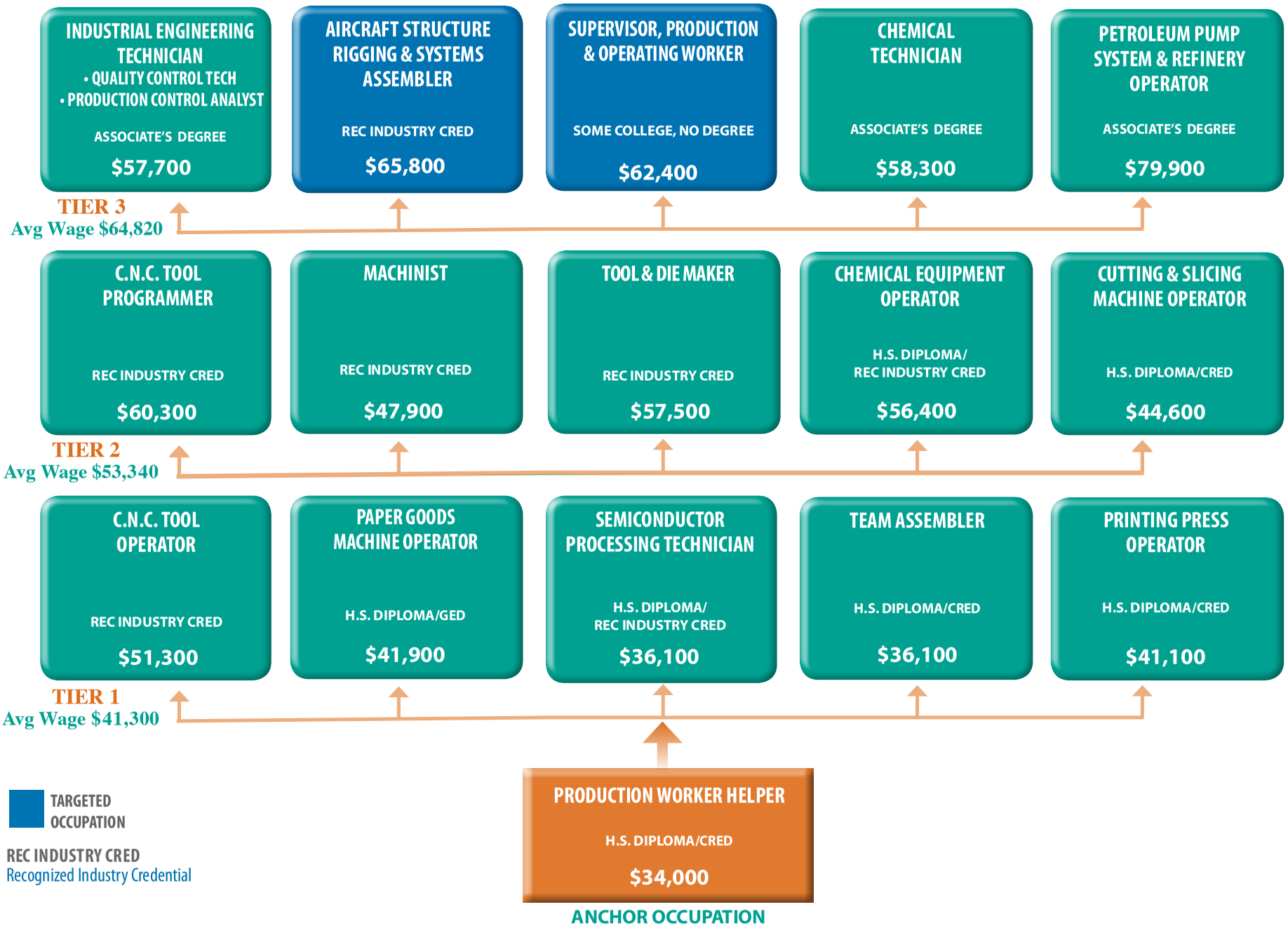

PROTECTIVE SERVICE WORKER, MISCELLANEOUS

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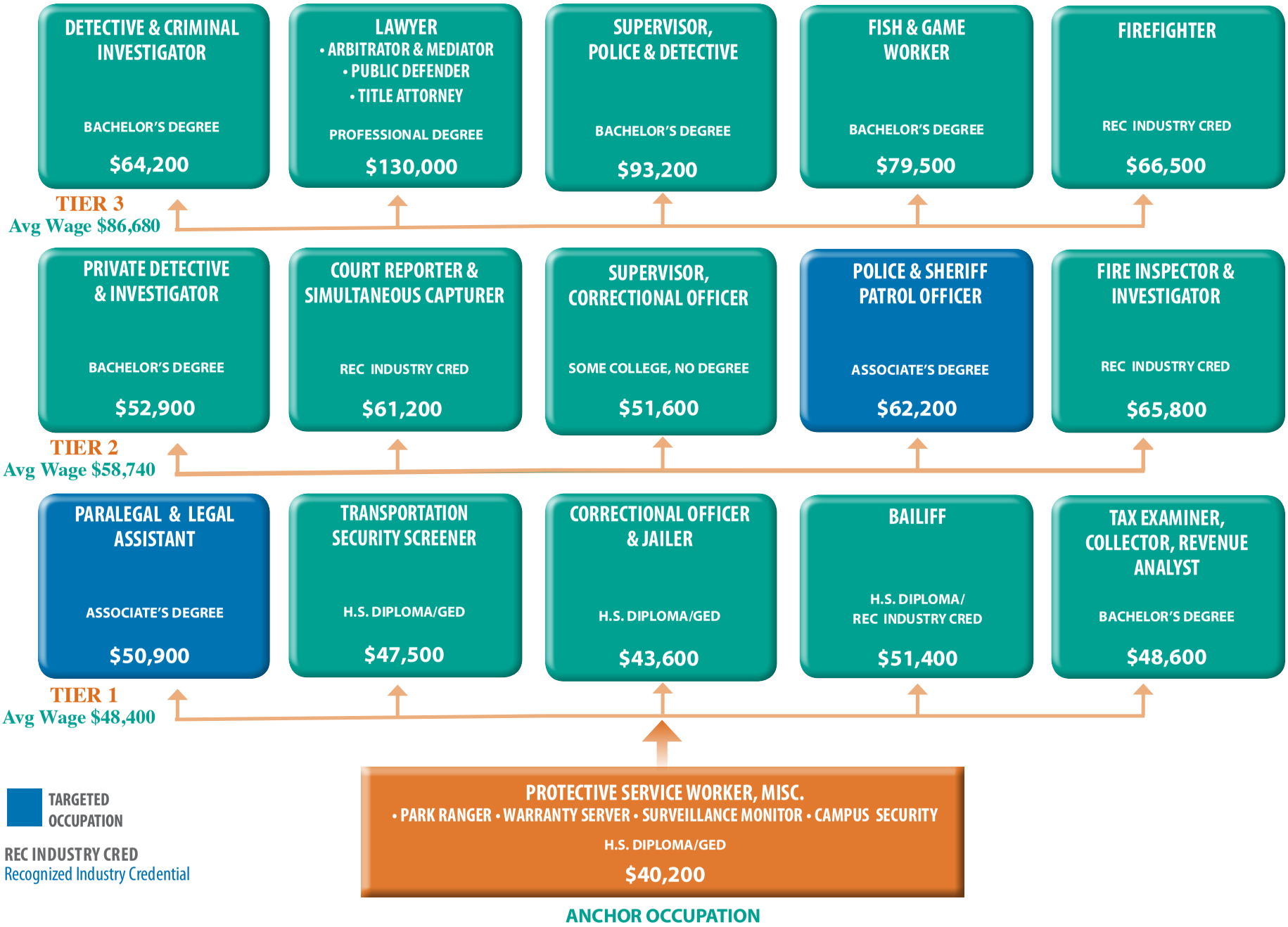

26 RECREATIONAL VEHICLE SERVICE TECHNICIAN

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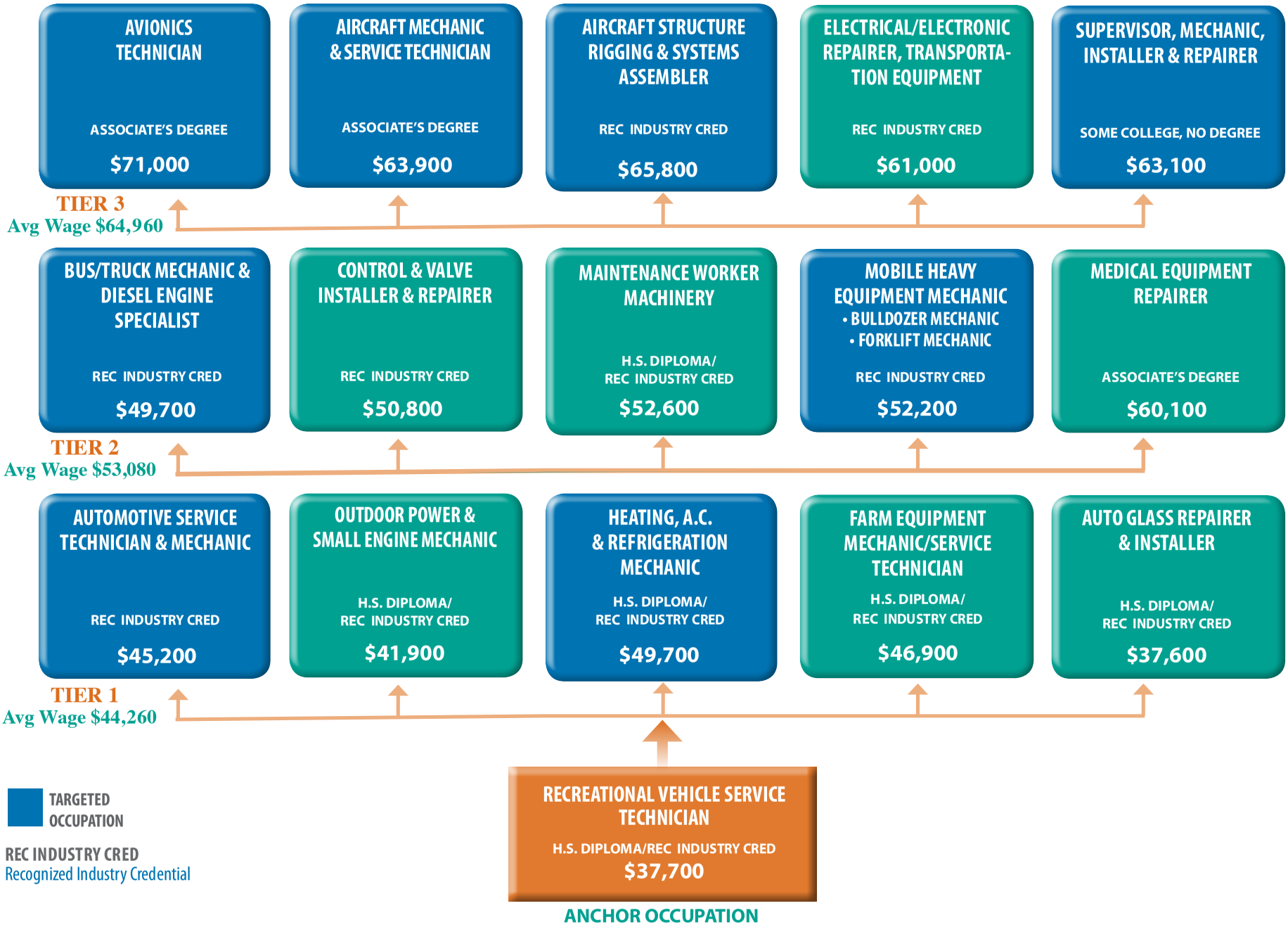
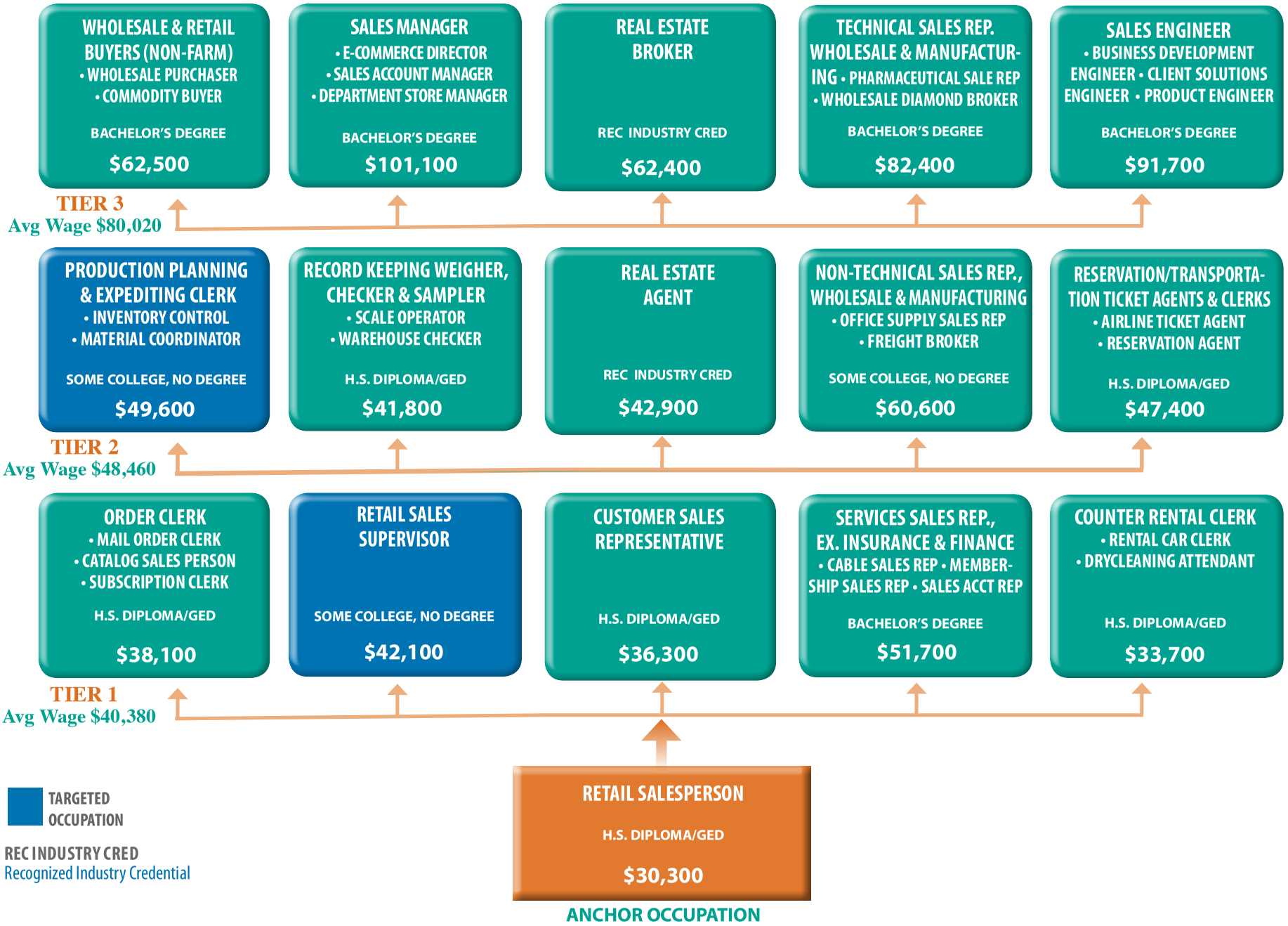


RETAIL SALESPERSON



28

SECURITY GUARD

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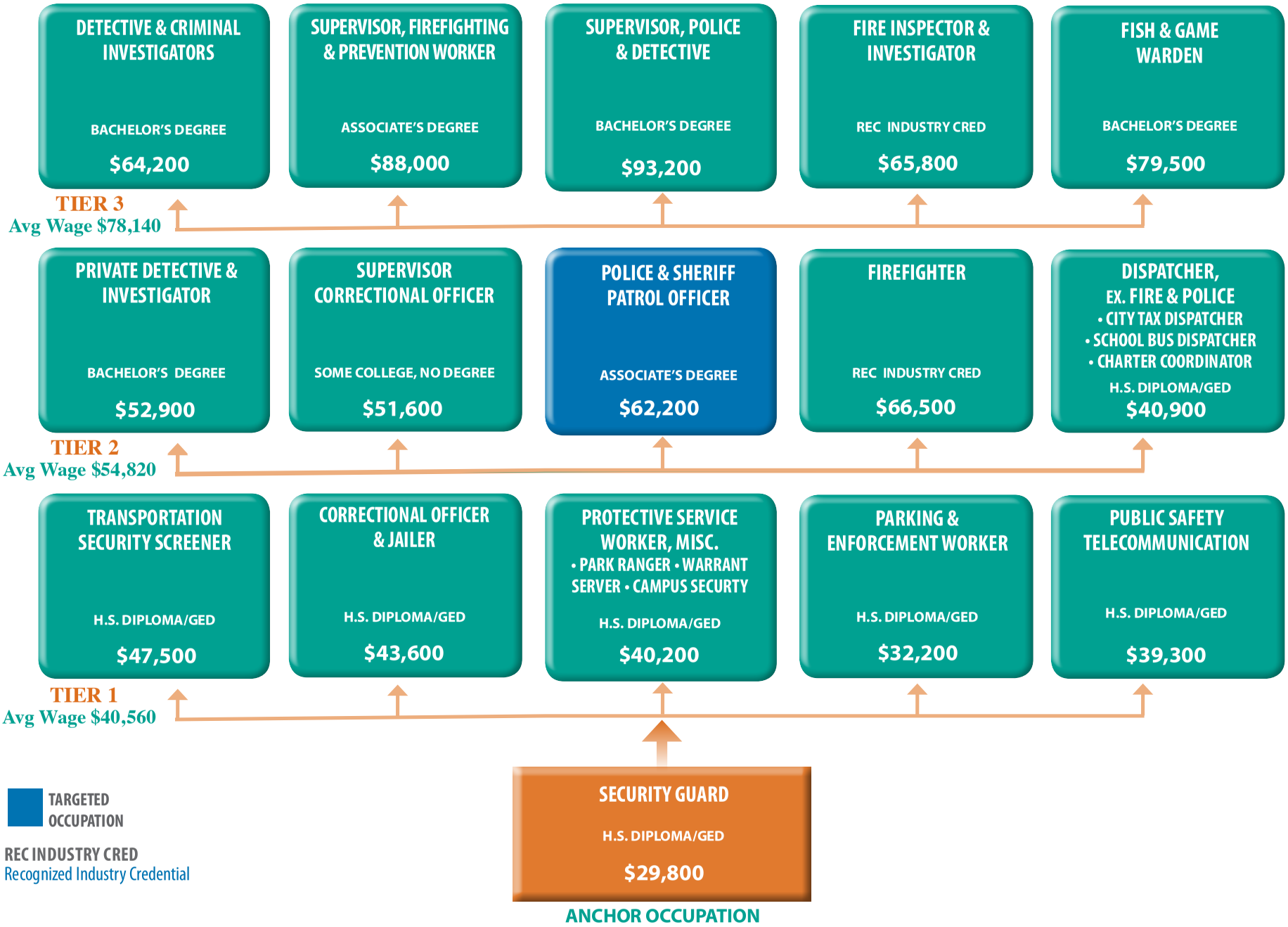
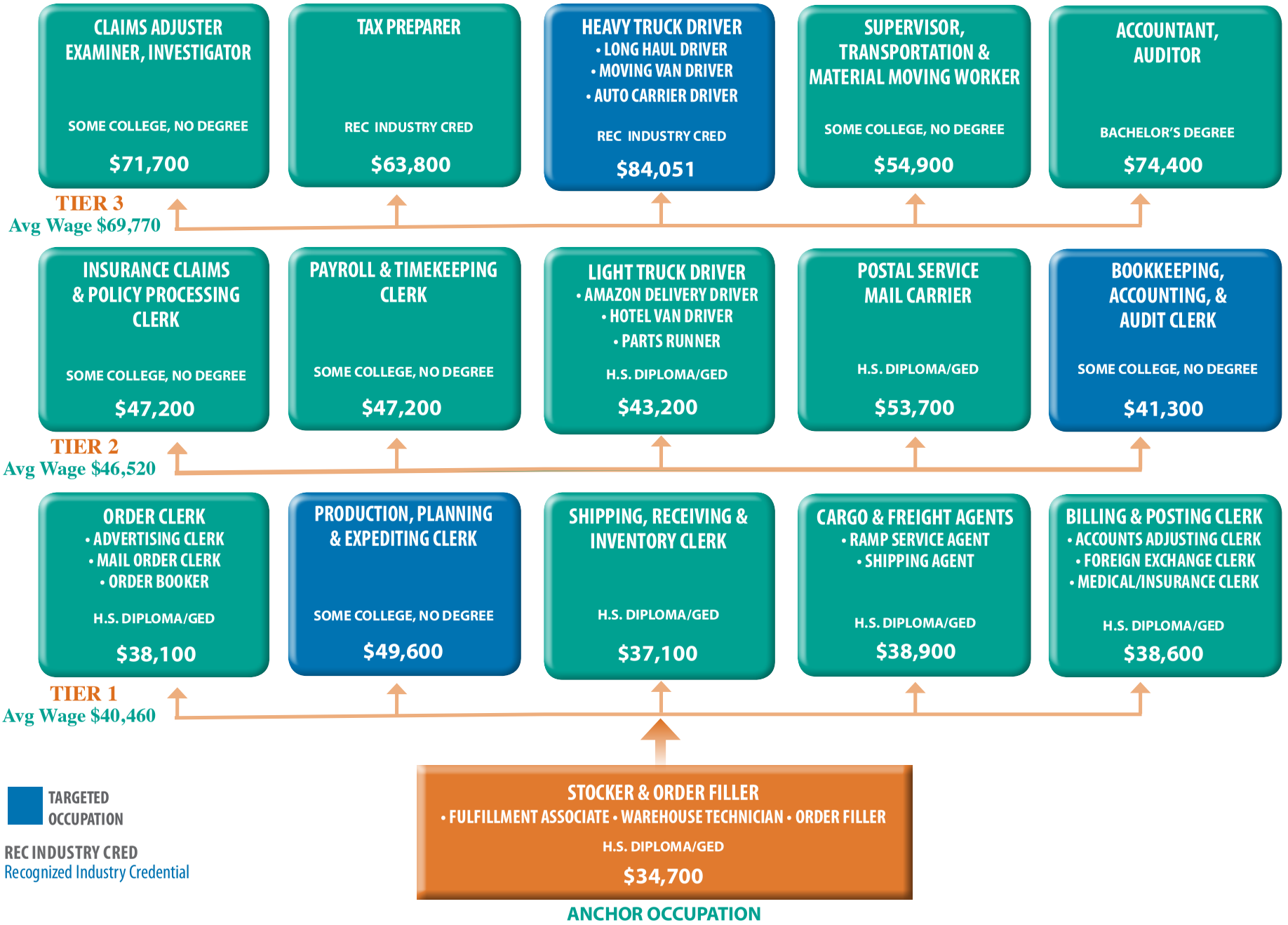


STOCKER & ORDER FILLERS

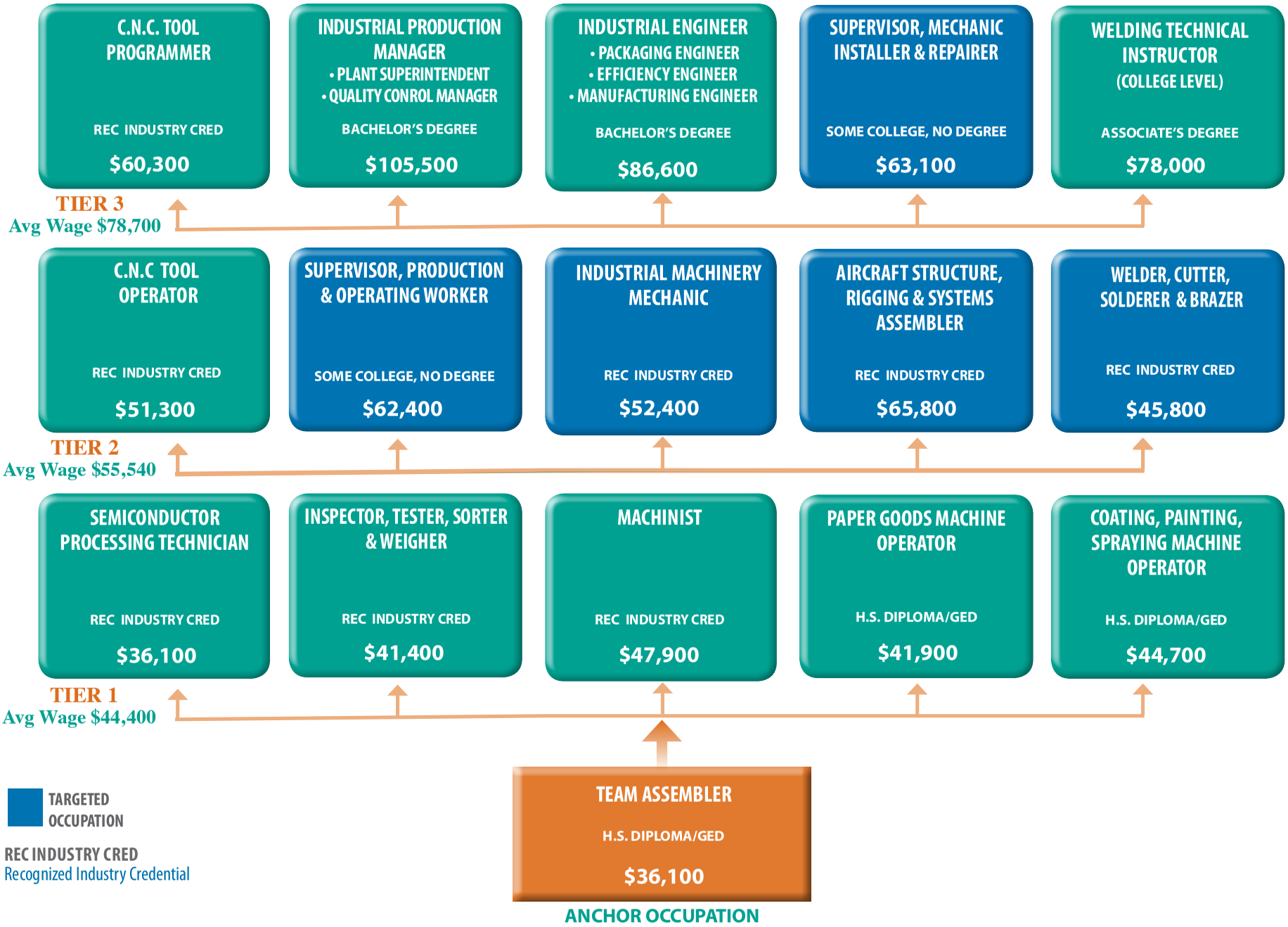
WORKFORCE SOLUTIONS HEART OF TEXAS



30

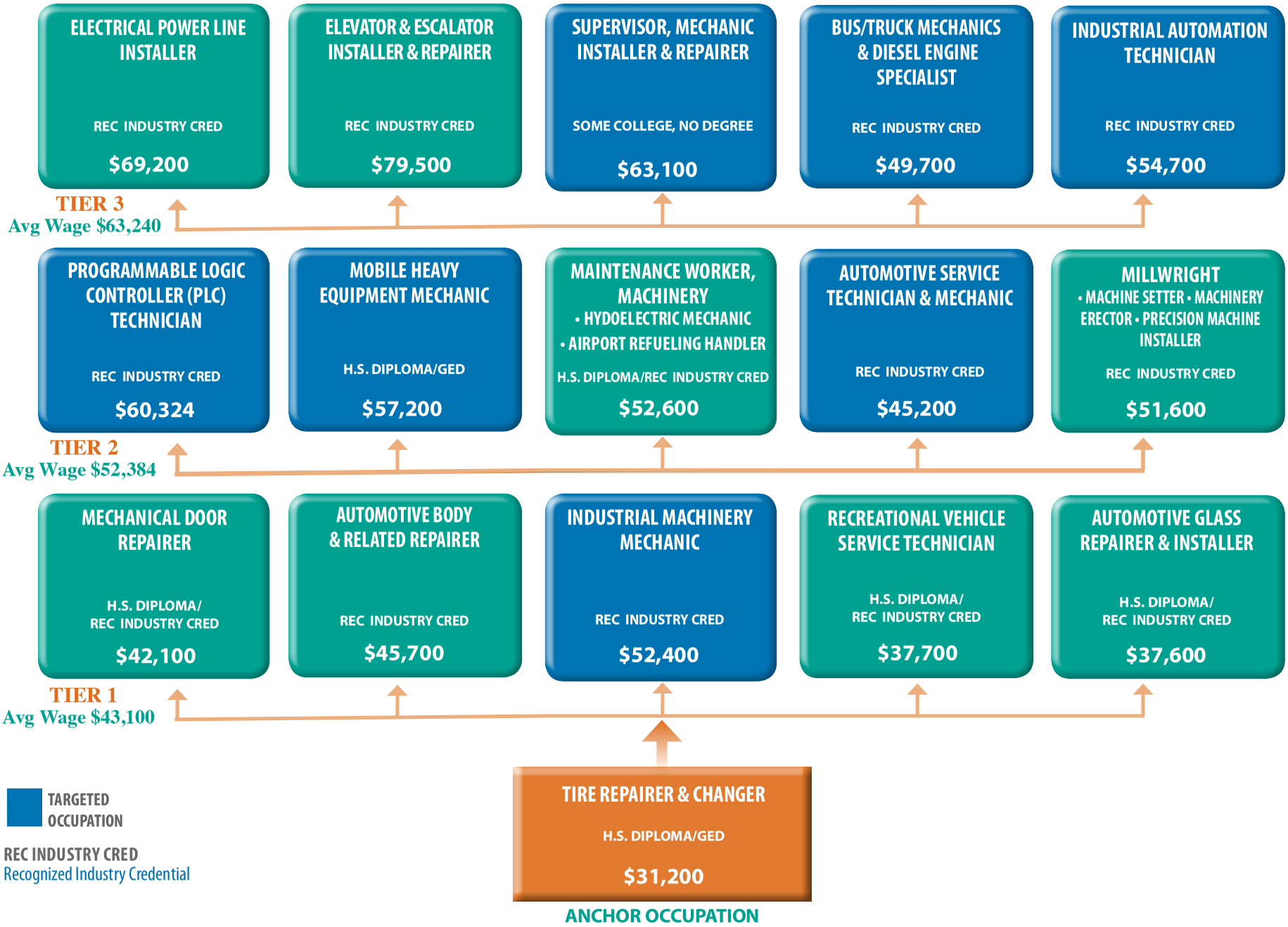
TEAM ASSEMBLER

WORKFORCE SOLUTIONS HEART OF TEXAS



TIRE REPAIRER & CHANGER

WORKFORCE SOLUTIONS HEART OF TEXAS



APPENDIX SECTION

APPENDIX A

Methodology and Approach to Building Career Progression Lattices

The concept behind upward wage mobility is simple; just find another job that pays more money! But life doesn't come with a roadmap that lays out everyone's path and labor market data are imperfect. And after high school most folks don't have access to a guidance counselor to help them navigate education and career options. Each person's career journey is unique. In other words, there is no right answer for everyone. But everyone deserves to know that there are advancement opportunities available if they are willing to make an investment in themselves to do what is necessary to benefit from them.

> ***"If you are not willing to learn, no one can help you. If you are determined to learn, no one can stop you."***
> Zig Zigler, American author & motivational speaker

The lattices developed for this project show possibilities for upward career and wage mobility based on the similarity of knowledge and tasks performed across occupations. It is one thing to understand that a Cashier routinely deals with the public, but another to examine the various other careers in which interacting with the public is also a valued skill. Or, for that matter, taking advantage of other skills like using a point-of-sale terminal, resolving invoice, purchasing, or payment discrepancies, or maintaining sales records. To do that we need a structured, skill-oriented, data-informed methodology that shows connectivity and similarity among occupations.

Each career progression is developed based on identifying related and transferable skills and common sub-knowledges among occupations. There is no such thing as a best or exclusive route to career success, even on the same lattice, for every individual. That would violate the very premise upon which the lattice concept is built. Each tier of a career progression lattice is based on the degree of skill and knowledge overlap or similarity between and among occupations. Behind each occupation on each tier of the lattice is a cosine similarity coefficient that measures the 'fit' between the Anchor occupation and each occupation on the subsequent tier. Behind the scenes in the skill and sub-knowledge matching process, the similarity coefficients provide a relative measure of the degree to which occupations share common skill sets and underlying knowledges. Clearly, the greater the similarity, the greater the likelihood that a person working in one occupation has the knowledge and skills needed to become qualified for jobs in similar occupations. Each tier of a lattice is designed to show multiple occupations with high skill and knowledge commonality.

It Starts with a Common Skills Language

The first step in the methodology was the construction of customized master data files that include detailed work activity[32] (DWA) profiles for each occupation, plus regional labor market data for the Heart of Texas region.

[32] A detailed work activity (DWA) is a transferable skill statement within an occupational title that describes specific activities a worker is likely to do on the job. DWA's represent the most practical, relevant, and pervasive proxy for a 'skill' in the current information marketplace – with 'skill' defined broadly as a capability to perform tasks that have a positive effect on productivity. The original DWA domain was developed as part of the content model for the federal ONET initiative.

To construct the source data files, a master database was built that includes all Standard Occupational Classification (SOC) occupations with several labor market metadata descriptors. A DWA profile was constructed for each SOC code in the occupational universe based on the *SkillsEngine* Detailed Work Activity skill library. *SkillsEngine* is a start-up initiative of the Center for Employability Outcomes (C4EO) at Texas State Technical College. *SkillsEngine* provides advanced skill curation and translation expertise that can be used to transform unstructured text into rich occupational metadata. The *SkillsEngine*[33] DWA library includes over a thousand job titles, but our analysis was limited to SOC occupations found in the Heart of Texas region to facilitate the connection with regional labor market information. The *SkillsEngine* DWA skill library is an enhanced and extended version of the ONET domain of the same name. It has been meticulously modified, expanded, and curated by TSTC/ *SkillsEngine* staff and outside industrial psychologists to improve consistent sentence syntax, appropriate action-based verb selection, and more complete and appropriate DWA-to-occupation assignments. The current version of the *SkillsEngine* DWA library has several thousand more skill-to-occupation assignments than ONET.

Regional labor market criteria

Attached to each occupation are several important regional labor market characteristics variables, including education level, wages, job postings, and employment projections. These data were used to regionalize the lattices to ensure that occupations not found in the HOT job market were not included on a lattice. Occupational wages are used to establish each tier on a lattice and to show the end user how much the median worker earns in that job within the region. Employment projections are used as a sorting criteria. In the final selection process, every effort was made to include those occupations that have the brightest employment outlook.

Education level plays an important part in the selection of Anchor occupations. However, as discussed in the section that contrasts Career Progression Lattices and Career Pathways, upward movement on a lattice is not dependent on achieving any specific educational award. Although it is not a requirement that formal education and training increases as one moves upward within a career lattice, invariably higher earnings are strongly correlated with higher levels of education. Thus, education level is one important labor market variable used in our calculations.

The most common source of education level by occupation is the 'typical education' variable developed by the Bureau of Labor Statistics (BLS). BLS researchers use an eight-category taxonomy within which every occupation is assigned a rating that is the typical entry-level education[34] . For career progression purposes, it is important to understand not only the entry-level education, but the educational requirement that allows a worker to be competitive for any job in that occupation.

[33] *SkillsEngine* also offers an API that can be embedded in any end-user software system to serve as the skill translation engine for profiling curricula, job postings, resumes, etc. See SkillsEngine.com for additional information on the API and other skill translation capabilities.
[34] The BLS education taxonomy is actually a three-part construct that includes additional domains for the typical level of on-the-job training and experience level associated with the occupation.

For some occupations there is little agreement on what the required education or training should be. There is also a question as to whether the education level should be based on the education level of workers already doing the job (incumbent workers) or the ideal academic credential tied to qualification. Many incumbent workers hold different (typically lower) education levels than what might be ideally desired by business. Cyclical patterns in supply and demand will cause business to loosen hiring requirements when the job market is tight and make them more stringent when job seekers are more plentiful. This results in a broader range of education levels for incumbent workers.

For this analysis we incorporate a proprietary education assignment construct called the Competitive Education Requirement (CER). The CER indicates the education level one typically needs to compete for available jobs in the occupation (Froeschle 2019). There are several noteworthy examples of the differences between the BLS and the CER data sets. For example, the BLS assigns the label of 'High School Diploma or Equivalent' to the occupation 'Electrician'. In reality, extensive training after high school is required to become a qualified Electrician. The BLS accounts for this through another domain they refer to as 'Training' in which they include training categories such as apprenticeship. The CER category of 'Recognized Industry Credential' (abbreviated as 'REC Industry CRED' in the lattices) replaces this rating. It implies high school graduation but also acknowledges the need for post high school instruction, training, and/or formal credentialling to compete for jobs in the occupation. The Recognized Industry Credential designation encompasses occupations which typically require a 1–2-year certificate, non-credit workforce program, e.g., Occupational Skill Award, license, third-party certification, or apprenticeship[35]. The majority of this training takes place at Community and Technical Colleges. It is noteworthy how many occupational options on the HOT lattices are included in this group, signifying excellent career opportunities requiring relatively short educational investments. Occupations rated as 'Some college, No degree' are typically assigned to supervisory positions and refer to the need for some discipline-specific college coursework but not necessarily degree attainment.

The CER also offers several hybrid educational categories that are more reflective of the competitive range of training options. For example, preparation for many information technology occupations can come from multiple sources. These include jobs for which a Bachelor's degree might be optimal, but workers with an Associate's degree or Certification with the required skills also can compete for jobs[36]. In lattice calculations these are reflected by the category Bachelors/Associates degree. Another hybrid category is High School Diploma/Industry Credential (abbreviated as High school diploma/IND CRED on the lattice graphic). These are occupations that typically require only a high school diploma or GED but where evidence exists that a third-party recognized industry credential is none-the-less valued in the job market.

[35]Combining all occupations that have a CER rating of Recognized Industry Credential, Associates degree and Bachelor's degree meets the WIOA definition of occupations with a Recognized Postsecondary Credential. WIOA Section 3. Definitions (52) defines 'recognized postsecondary credential' to mean a credential consisting of an industry-recognized certificate or certification, a certificate of completion of an apprenticeship, a license recognized by the State involved or Federal Government, or an Associate or Baccalaureate degree.

[36]The tighter the occupational labor market, the more likely an employer is to lower formal education requirements.

Occupational wage data is a critical piece of the labor market landscape for lattices. For this project, we extracted the 2023 median occupational wages and ten-year (to 2033) occupational projections from Chmura Economics for the Heart of Texas LWDA. The wage and employment projections data provide key significance on two fronts. The wage data are particularly important in constructing the various tiers of the career progression lattice. Chmura uses an updating algorithm keyed to job postings to provide more current wage data which was valued in this highly volatile and competitive wage environment. There was some thought to using the entry-level or 10th percentile wage figure, but the lattice is intended to portray likely employment scenarios which are better reflected by the median. That said, some occupations offer higher premiums for experienced workers. Newly-hired workers should not expect to earn that wage level.

For most regions, Chmura typically provides occupational projections and wage data for 843 SOC occupations. Because the labor market data are used to drive a comprehensive weighting methodology that covers the universe of occupational employment, it is a priority to have complete coverage for all occupations. The employment projections allow for regionalization of the lattices which reflect the local industry structure. It is not a coincidence that so many of the lattices surround the manufacturing, healthcare, and retail trade sectors as they have been major drivers of the HOT economy.

Finally, the lattices are designed to help workers in the Heart of Texas region. It makes little sense to include an occupation on a lattice that doesn't have any actual employment in the region. While the lattice processing algorithms included all occupations in the SOC universe, final occupations selected to appear on a lattice required 10 or more third quarter 2023 employment in the HOT region. Effectively, the final universe for the Heart of Texas was winnowed to 681 occupations for lattice consideration.

Selecting Anchor Occupations

The primary goal of the career progression lattice initiative is to describe a framework within which people can; 1) understand access points to reach the high demand/high wage Target Occupations identified by Workforce Solutions Heart of Texas, and 2) visualize and plan for long-term upward wage mobility. The Target Occupation list by definition is populated by occupations that require some type of post-secondary occupational-specific training or credential. The list is used to guide education and training investments funded by the HOT Board so they must lead to a self-sufficient wage and require some level of training. Thus, the occupations on the Target List are not typically entry-level. Which means they are not intended to serve as Anchor occupations in a career progression lattice.

So what is an Anchor occupation? In lattice terminology the Anchor occupation is simply an entry-level occupation, one which typically requires lesser education and training. By definition, the Anchor occupation requires less education and pays a lesser wage than the Target Occupations that are included in the upper tiers of the lattice.

So what is an Anchor occupation? In lattice terminology the Anchor occupation is simply an entry-level occupation, one which typically requires lesser education and training. By definition, the Anchor occupation requires less education and pays a lesser wage than the Target Occupations that are included in the upper tiers of the lattice.

The HOT Target Occupations list includes thirty-five occupations. Several of these have skill and knowledge similarities such that a single lattice can include multiple Target Occupations. It is beyond the scope of this project to build lattices for every possible entry-level job. In order to identify the best Anchor occupations that could serve as stepping stones to a Target Occupation, we conducted a reverse lattice calculation. Each Target Occupation is analyzed to identify multiple entry-level occupations that meet the following criteria:

1. The Anchor must have a median wage less than the Target Occupation
2. The Anchor must have an equal or lesser competitive education level as the Target Occupation
3. The Anchor should have the highest possible similarity with the Target Occupation based on the a) number of common work activities and b) common sub-knowledge profile
4. The Anchor must have at least ten currently employed individuals in the Heart of Texas economy to make it applicable specifically to the regional labor market[37]. Occupations were selected that had higher levels of regional employment, whenever possible
5. Whenever possible, the Anchor occupation should be among those occupations from which current dislocated or unemployed workforce customers were last found working. This prioritizes Anchor occupations that best match the most Board customers, making the lattices useful to more Workforce Solutions HOT customers[38] .

The top seven (7) Anchor candidates were identified for each Target Occupation[39].
The first cut of this process resulted in 226 potential Anchor occupations that covered all 35 HOT Target Occupations. Winnowing the list to a manageable number is an optimization challenge. The objective is to identify occupations that will align with the most Target Occupations across the various tiers of a lattice, while also making certain that every Target Occupation is connected to at least one Anchor occupation. In this optimization process duplicate occupations were eliminated, along with occupations which had the same or higher CER education rating. Remaining occupations were manually reviewed to identify Target Occupations that naturally fit on the same career lattice, eliminating the need for another unique lattice. The final total of thirty-one (31) Anchor occupations included some Target Occupation redundancy but that only serves to highlight the point that one can leverage skills from several different starting places and reach the same career objective.

[37]The HOT region had a labor force of 178,704 people with 173,142 identified as working as of December 2023. For both categories that represents 1.2% of the Texas job market. As a relatively small economy, the Heart of Texas naturally has less industrial and occupational diversity than other larger metro areas or Texas statewide. The Chmura labor market database used in this exercise includes 843 occupational titles in Texas with 20 or more employment. Conversely, the Heart of Texas has only 681 titles with 10 or more employment; the minimum employment threshold to be included on a lattice. The lesser diversity eliminates from consideration many job titles that might have skill or knowledge similarity but do not exist in sufficient numbers in the Heart of Texas region to justify inclusion on a lattice.

[38]For this exercise TSTC solicited a list of UI claimants by job title. These titles were crosswalked to SOC codes and formatted for anchor occupation consideration.

[37]In several instances, such as for Dental Hygienists and Paralegals and Legal Assistants, it was not possible to identify seven reverse lattice possibilities.

Defining the Career Lattice Decision Metrics

The database described above is built around the core process for identifying sequentially higher tier occupations on a career progression lattice from the anchor occupation. The key question in constructing the career progression lattice is what determines which occupations are sufficiently similar that they can be viewed as a viable career objective, require a minimal amount of additional education and training, and build upon the individuals existing skill set based on their work experience.

There are three primary dimensions around which lattice occupations are grouped and selected. Each of these metrics has strengths and limitations, but collectively they paint a compelling picture of career progression alignment.

Heart of Texas Primary Anchor Occupation List 2024

	Anchor Code	Anchor OCC	Anchor CER Label	Anchor Median Wage
1	51-2099	Assemblers and Fabricators, All Other	High school diploma or GED	$37,100
2	13-1041	Compliance Officers	Bachelor's degree	$58,100
3	15-1232	Computer User Support Specialists	Recognized Industry Credential	$51,000
4	47-2061	Construction Laborers	No formal education	$36,200
5	35-2012	Cooks, Institution & Cafeteria	H.S. Diploma/IND CRED	$29,000
6	43-4051	Customer Service Representatives	High school diploma or GED	$37,000
7	29-2042	Emergency Medical Technicians	Recognized Industry Credential	$32,500
8	43-9061	General Office Clerks	High school diploma or GED	$37,400
9	51-9198	Helpers, Production Workers	High school diploma or GED	$35,100
10	47-3013	Helpers, Electricians	High school diploma or GED	$37,200
11	49-9098	Helpers, Installation, Maintenance & Repair	High school diploma or GED	$32,200
12	31-1121	Home Health Aides	High school diploma or GED	$32,200
13	43-4081	Hotel, Motel, & Resort Desk Clerks	High school diploma or GED	$25,600
14	49-2000	Industrial Automation Technicians	Recognized Industry Credential	$54,700
15	49-9099	Installation, Maintenance & Repair Workers, MISC	High school diploma or GED	$39,200
16	49-9071	Maintenance & Repair Workers, General	H.S. Diploma/IND CRED	$38,900
17	31-9093	Medical Equipment Preparers	High school diploma or GED	$37,600
18	33-9099	Miscellaneous Protective Service Workers	High school diploma or GED	$32,200
19	53-3099	Motor Vehicle Operators, MISC	High school diploma or GED	$25,600
20	51-4081	Multiple Machine Tool Operators	High school diploma or GED	$34,200
21	31-1131	Nursing Assistants	Recognized Industry Credential	$31,100
22	49-3053	Outdoor Power & Other Small Engine Mechanics	H.S. Diploma/IND CRED	$41,900
23	31-9095	Pharmacy Aides	High school diploma or GED	$29,500
24	31-2022	Physical Therapist Aides	Recognized Industry Credential	$29,700
25	49-3092	Recreational Vehicle Service Techs	H.S. Diploma/IND CRED	$37,700
26	41-2031	Retail Salespersons	High school diploma or GED	$30,300
27	33-9032	Security Guards	High school diploma or GED	$34,200
28	53-7065	Stockers & Order Fillers	High school diploma or GED	$34,700
29	39-1022	Supervisors, Personal Service Workers	Some College, No Degree	$36,500
30	51-2092	Team Assemblers	High school diploma or GED	$36,100
31	49-3093	Tire Repairers & Changers	High school diploma or GED	$31,200

One dimension is alignment based on the underlying subject matter knowledge within which workers function. We refer to these as 'sub-knowledges.' This dimension looks at

the extent to which two occupations share the same sub-knowledge orientation[40]. In the language of curriculum development this sub-knowledge dimension can be viewed as a foundational or shared academic understanding that undergirds the execution of a work activity, a.k.a. the performance objective in a learning outcome.

The sub-knowledge measure is excellent for envisioning how a certain knowledge profile could be used to create a long-term career progression. But it does not adjust for the necessary proficiency levels within a sub-knowledge. Which means that when you compile the related sub-knowledges based on their respective work activity profiles both a Respiratory Therapist and a Nurse Practitioner have high concentrations of sub-knowledge in Basic Patient Care, General Medicine and Practice, and Health and Wellness and thus have highly correlated sub-knowledge profiles. But the proficiency level at which workers in each occupation must practice each sub-knowledge is quite different and the actual duties performed on the two jobs vary widely. When this is the case, the other major variable, complex skills similarity, becomes the primary differentiator between any given occupational pair.

Linked pairs of occupations can also have common sub-knowledge profiles and yet have widely divergent formal educational requirements and proficiency levels. Healthcare occupations, which include multiple PhD or Professional Degree designations, tend to fall in this category. A linked pair that includes a Neurologist and a Licensed Vocational Nurse has similar sub-knowledge profiles and yet it is hard to think of them as being connected on a Career Lattice. Yet, that common knowledge profile, while at two different proficiency and formal education levels, does indeed connect these two occupations.

The second dimension is the commonality of all work activities typically performed by workers in an occupation. This dimension is referred to as 'skill-based' while the sub-knowledge dimension is termed 'knowledge-based.' The biggest difference between the two dimensions is that a common knowledge foundation is likely to span occupations that typically have a wide range of educational requirements. As another example, take two occupations, Respiratory Therapist, which typically requires an Associate's degree, and Nurse Practitioner, which typically requires a Master's degree. Although their sub-knowledge profile is highly correlated, they only have 35 percent of work activities in common. Thus, to optimally define the similarity across occupations, knowledge similarity must be balanced by the commonality of work activities performed on the job.

On a more pragmatic note, occupations such as Electrician Helper and Electrician share a highly aligned sub-knowledge profile, and this measure does an excellent job of linking them together. The sub-knowledge cosine similarity scores are a key metric to identifying occupations which share common academic foundations.

A work activity profile shows the extent to which common, transferable skills are practiced across occupations. While the issue of proficiency still exists, the skill commonality is more granular than the sub-knowledge domain. Comparing work activity profiles allows for a detailed skill gap analysis. This highlights which skills are practiced in common, and which are unique to each occupation.

[40]A cosine similarity matrix approach was applied to the *SkillsEngine* sub-knowledge domain to identify the most highly correlated occupational pairs. This approach allows for comparisons of two text-based vectors (sub-knowledges) using the Complexity Index for vectorization. Outputs are normalized such that a score of 1.00 would be perfect correlation.

Someone wanting to change occupations can be reasonably assured that, for example, they already have 60 percent of the requisite skills and thus need to master only 40 percent of the skills that are unique to the desired Target Occupation or occupational goal[41]. This should motivate a job seeker knowing that they already have many of the necessary skills, and also lessen the upskilling investment needed to compete for a new job.

But what if there is a strong total skill match between two occupations but certain job-critical skills are among those missing? A simple skill count match rate can result in a high percentage of common skills, yet the missing skills may be those most *critical* to success in another occupation. They may also be those skills that are the most difficult to attain or master. This introduces the need for another way to assess alignment based on commonality of critical skills. Moreover, not every occupational profile in the *SkillsEngine* skill library has the same number of DWAs, so a simple match count provides an incomplete story of the importance of the matched vs. unmatched skills. Thus total DWA match count was considered in the final selection decision as to which occupations were selected for a given tier, but it was not part of the rating algorithm.

The third dimension in this analysis is a subset of the complete transferable skills or work activities measure discussed above. It is evident that all skills are not created equal. Work activities such as *'Bus tables in dining area'* and *'Clean equipment and supplies'* are rudimentary and can be done by almost anybody with no formal instruction or education. Simple counts of common skills which can be performed by anyone are not a sufficient measure of alignment and do not highlight crucial skills that are most likely to drive common qualification.

Every work activity has a degree of complexity that determines the level or mode of education and training typically needed to perform it successfully. In other words, some skills are so simple they require nothing more than verbal instruction while others require years of formal academic or technical training. The extent to which a work activity requires formal instruction is a significant indicator of the complexity of the skill required.

To make this adjustment we calculated a cosine similarity matrix score for each pair of occupations which was normalized to the top 100 DWAs for each occupation. A proprietary Complexity Index score was used to prioritize the top 100 DWAs for each occupational pair[42]. This measure is designed to control for the possibility that any two occupations could have a high DWA match rate and yet lack alignment or similarity on the most crucial and distinctive work activities. Those work activities that typically require some formal instruction are identified as higher complexity. The third dimension identifies the extent of match among work activities viewed as higher complexity and are a critical input to the match algorithm and progression lattice assignment process.

[41]There is no guarantee here that the person has performed the work activity admirably or to a high degree of proficiency just because they held a job that includes the activity in its profile. However, with exceptions for licensed occupations, proficiency is established at the individual job level. The career progression lattice concept does not purport to address varying job-specific proficiency requirements.

[42]The SkillsEngine DWA library has an internal proprietary set of metatags established through statistical inference adding explanatory power to each. There are three metatags that comprise a Complexity Index score for each DWA, including Education Source based on a variation of the Blooms taxonomy, a competitive education level, and an employment-weighted median wage rating calculated across occupations in which a DWA is found. Occupations that have higher market value and typically require post-secondary instruction are deemed more complex. For greater detail see R. Froeschle, *Not All Skills Are Created Equal: Creating a Work Complexity Score in the SkillsEngine DWA Database,* 2021 (unpublished).

Summary Methodology and Career Lattice Data Elements

The lattices presented herein are determined by a highly data-driven methodology. Some occupational linkages are intuitive, while others are less obvious. But the connections are based on statistical skill, sub-knowledge, and labor market similarities.

The universe of occupational options included 843 SOC occupational classifications along with additional regionally specific alternate occupations. The final universe was winnowed to 681 occupations to ensure that only occupations with at least 10 workers were included in the calculations.

The process starts with the selection of Targeted Occupations. Thereafter, the fundamental base line questions are (1) to what extent does one occupation match another along multiple labor market and skill indicators, and (2) to what extent does an occupation differ when compared to all possible occupations in the labor market.

The matching approach uses 4,860 Detail Work Activities (DWA) and 368 sub-knowledge groupings from SkillsEngine assigned to each occupation in order to represent various levels of skills needed to perform on the job. Lattice calculations were applied in reverse to identify Anchor occupations that were entry-level in nature and yet represented high skill connectivity with the Heart of Texas pool of Target Occupations.

Each of the Anchor occupations subsequently serves as the entry point for assessing occupational linkages and career lattice associations. For tier level ascension through the career lattice, career choices are analyzed and placed on the lattice based on skill and sub-knowledge similarity, education/training, salary, and related LMI attributes. Early versions of lattice creation were based primarily on the number of DWA skill matches among occupations.

The new method incorporated the cosine similarity matrix approach to optimize and statistically score the qualitative value offered by the DWA and sub-knowledge domains. The efficacy of the cosine similarity approach was tested and reviewed for face validity. Statistical cosine similarity coefficients (using newly developed, DWA-centric Complexity Scores for vectorization) were calculated for the sub-knowledges and DWAs in each occupational profile.

The top 100 DWAs based on Complexity Score were used to 1) normalize comparisons across occupations such that each occupational profile included only the top 100 most complex work activities, and 2) reduce the potential impact of common, easily performed work activities on the linkage process.

Numerous data tables were built for these coefficients to aggregate both sub-knowledges and DWAs and were rebuilt for each tier within each lattice.

Processing algorithms identified matching decision points for DWA skills and sub-knowledges between and among all possible occupations in the HOT labor market. For these calculations we assigned a 55% weight to the complex skills cosine similarity score and 45% to the sub-knowledge cosine similarity score. Total DWA match count was considered in final selections but was not part of the algorithm.

The same processing algorithms were applied to each tier of each lattice in an iterative fashion based on an aggregate skill profile developed for the five occupations in the preceding tier. The new skill and sub-knowledge profiles were processed as an aggregate to arrive at decision points for the next tier of occupations. Embedded thread matches – statistical interrelationships among occupations - were compared to all possible occupations using critical highest associations for decision points.

The ultimate selection of which occupation was placed in which tier was subjective, based on high point and cut-off parameters of DWA, sub-knowledge, and LMI inputs.

Developing Career Progression Lattices

To develop the career progression lattices from each Anchor occupation, five occupations constituting Tier I occupational options were selected based on;

1) Highest match score with the Anchor occupation based on the total work activities match rate which captures the percentage of DWAs an occupation has in common with an Anchor occupation.
2) Highest cosine similarity matrix scores based on the top 100 most complex work activities.
3 Highest cosine similarity matrix scores based on the sub-knowledge domain.
4) Regional occupational wages which are at or above the Anchor occupation
5) Regional employment in the third quarter of 2023 in the Heart of Texas. Occupations with employment less than 10 were not considered regardless of the strength of match in the other variables.
6) The closest competitive education requirement (CER) level to the Anchor occupation and for each successive tier. The reason for selecting close education requirement levels is to show opportunities for earnings advancement that do not necessarily require additional formal education. *A lattice is intended to demonstrate upward wage mobility but with the least amount of additional formal education.*

Although each of the thirty-one career lattice diagrams starts with an Anchor occupation, in practice that process starts with a worker's resume or related work history that qualifies them for employment in the Anchor occupation. An individual's resume serves as a proxy for their previous education, experience or qualifications that qualifies them to perform in the Anchor occupation.

It is important to recall that this Career Progression project is linked to the HOT Target occupations list, and Anchor occupations were selected based on their proximity to one or more Target Occupations. Every effort was made to select Anchor occupations that are typically viewed as 'entry level' to make the lattices most useful to those without jobs, those Workforce Solutions HOT customers who appear as unemployment claimants, or those cycling within the secondary labor market.

However, two things are true; 1) the project did not create lattices for every entry-level job in the regional labor market[43], and 2) for some workers getting a job in one of the Anchor occupations could represent a career achievement. A previous report titled *Everyone Starts Somewhere* highlights the fact that at any time each of us finds ourselves somewhere in the world of work. It might be at an apex job, an entry-level job, moving up or going nowhere fast. Career Progression Lattices don't judge wherever you find yourself, they only offer a vision for moving your career forward. For some workers getting a job in an Anchor occupation can be defined as success.

[43] For the Heart of Texas we identified 273 occupations that typically require either no formal education or a high school diploma/GED. We also created a UI claimants file that showed the most common occupations previously held by Workforce Solutions customers. In theory each of these occupations could be viewed as an entry-level job in the sense that no additional post-secondary education is required. It is important to remember that this is an analysis of jobs and not workers. There is no such thing as a low-wage worker, there are only low-wage jobs.

To construct a lattice, each Anchor occupation was compared to all other SOCs based on the variables outlined above. Using this approach, each Anchor occupation was connected to multiple potential Tier I occupations prioritized by the strength of match algorithm. Alignment scores of 40 and above for the combined cosine similarity coefficients were considered as optimal first tier potential matches for the Anchor occupation. Education levels and wages were also considered in the selection of the five Tier I occupations[44].

To determine Tier II occupations, a cumulative DWA profile was created that was a composite of DWAs from the Anchor occupation, plus DWAs from all five Tier I occupations. This creates a new 'super Anchor' occupational profile and assumes that workers on this lattice have an expanded skill set from working in at least one of these occupations that should be considered when seeking higher order opportunities[45]. Tier II occupations were selected based on closest education level, the highest possible skill and sub-knowledge cosine similarity coefficients, a minimum of 10 regional employment, and a median wage that is above the Tier I average for all Tier I occupations. The chart below shows the average earnings for each tier for all the lattices.

Average Wage by Tier for Heart of Texas Career Progression Lattices

	Anchor Occupation Lattice	Anchor Median Wage	Tier 1 AVG Wage	Tier 2 AVG Wage	Tier 3 AVG Wage	Highest Paying Apex Occupation
	Tier Averages	**$35,857**	**$44,546**	**$57,450**	**$80,747**	**$104,315**
1	Computer User Support Specialists	$51,000	$66,940	$87,000	$117,040	$134,100
2	Nursing Assistants	$31,100	$41,080	$71,360	$110,780	$217,500
3	Industrial Automation Technicians	$54,700	$61,191	$73,360	$102,940	$135,300
4	Emergency Medical Technicians	$32,500	$46,280	$63,360	$92,280	$104,000
5	Compliance Officers	$58,100	$60,060	$66,500	$92,020	$131,400
6	Physical Therapist Aides	$29,200	$39,120	$60,640	$91,460	$104,000
7	Customer Service Representatives	$36,300	$42,380	$59,460	$87,120	$131,400
8	Protective Service Workers, Miscellaneous	$40,200	$48,400	$58,740	$86,680	$130,000
9	Home Health Aides	$22,800	$31,500	$56,020	$86,460	$118,200
10	General Maintenance & Repair Workers	$38,900	$49,100	$51,860	$83,867	$124,000
11	General Office Clerk	$37,400	$40,780	$52,120	$82,900	$107,600
12	Medical Equipment Preparers	$37,600	$42,261	$58,460	$81,560	$100,300
13	Retail Salespersons	$30,300	$40,380	$48,460	$80,020	$101,100
14	Personal Service Workers Supervisor	$36,500	$49,940	$60,240	$79,940	$104,200
15	Team Assemblers	$36,100	$44,400	$55,540	$78,700	$105,500
16	Security Guards	$29,800	$40,560	$54,820	$78,140	$93,200
17	Assemblers and Fabricators, All Other	$37,100	$42,060	$54,020	$77,580	$86,600
18	Pharmacy Aides	$29,500	$36,660	$51,480	$76,360	$106,200
19	Motor Vehicle Operators, MISC	$25,600	$40,070	$52,580	$75,675	$86,700
20	Electricians Helpers	$37,200	$48,380	$60,487	$75,180	$82,600
21	Outdoor Power & Other Small Engine Mechanics	$41,900	$47,660	$64,680	$74,487	$82,600
22	Installation, Maintenance & Repair Helpers	$32,200	$48,280	$54,607	$70,620	$84,700
23	Stockers & Order Fillers	$34,700	$40,460	$46,520	$69,770	$84,051
24	Multiple Machine Tool Operators	$34,200	$42,420	$56,380	$69,700	$94,700
25	Institution & Cafeteria Cooks	$29,000	$32,700	$44,380	$69,640	$99,300
26	Construction Laborers	$36,200	$42,340	$52,860	$68,660	$85,600
27	Hotel, Motel, & Resort Desk Clerks	$24,700	$34,040	$40,860	$67,360	$72,600
28	Installation, Maintenance & Repair Workers, MISC	$39,200	$51,380	$60,271	$65,700	$71,100
29	Recreational Vehicle Service Techs	$37,700	$44,260	$53,080	$64,960	$71,000
30	Production Workers Helpers	$34,000	$41,300	$53,340	$64,820	$79,900
31	Tire Repairers & Changers	$31,200	$43,100	$52,384	$63,240	$79,500

[44]While this project was largely limited to SOC occupations, there is nothing that precludes adding non-SOC occupations as long as a DWA profile and regional LMI are available. For this project we created profiles for three non-SOC occupations; PLC Technician, Industrial Automation Technician (17-30XX), and Electrical Power and Industrial Systems Technician (49-20XX) and assigned each a unique code. As expected, these occupations appear on several Lattices.
[45]The 'super Anchor' DWA profile is based on the statistical manipulation of three fundamental content values. The goal is to create a robust skill and sub-knowledge cluster for each occupation from the previous tier.

The same iterative process was performed to generate Tier III occupations. In this iterative process, each tier of SOCs brings forward a cumulative DWA cluster profile from the preceding pass, excluding redundant SOCs from lower tiers. In other words, as we move from the Anchor occupation through the various tiers, each match against the remaining occupational universe includes all the DWAs that have been accumulated, weighted, and re-ranked based on previous occupational options.

The final occupational selections are essentially subjective, driven by highest skill and sub-knowledge match based on the cosine similarity coefficients, high overall DWA match scores, evidence of above average labor market demand, and median wages. The competitive education level is considered but it is not the primary driver. For example, in the case of the Heart of Texas, several lattices have Tier III occupations that require only an Associate's degree, e.g., Radiologic Technicians on the Pharmacy Aide lattice and MRI Technician on the Medical Equipment Preparer lattice[46].

The occupations selected for the career lattice map represent the highest similarity with occupations from the preceding tier. It is important to note that limiting the progression to five top occupational matches is arbitrary, mostly to facilitate visual display of the data. In reality, each tier can have many more highly matched occupational options. The goal of building the career lattice maps is to quickly demonstrate the potential for progression, not to catalog all possible options.

Although the potential for upward career movement is theoretically unlimited; by including only the best aligned occupations across three tiers, the lattices show possible career paths starting with each Anchor occupation. The competitive education level is considered in building the tiers in each lattice, but as noted previously, upward movement from one tier to the next might require extensive additional formal education. In thinking about career progression from the perspective of a lattice, there is no such thing as a 'dead end' job, i.e., one from which there are no upward paths. In fact, any given Tier 2 occupation, for example, could be an Anchor occupation for another lattice. But clearly there are occupations from which upward movement requires considerable skill enhancement in the form of a postsecondary degree, license or certification, or other credential[47].

[46]There are five steps in the final selection process;
1) Review the highest skill and sub-knowledge match options, 2) Sort the working file by regional occupational wage. The average earnings from the preceding tier sets the floor for next level options. Eliminate occupations, even high skill match occupations, with wages below the floor,
3) Examine remaining options for high skill and sub-knowledge match scores and above average regional labor market demand. Select options that score as high as possible along both dimensions. Highlight these for final review, 4) Consider education, available job postings, total DWA match count, and field of study alignment from preceding tier selections, and 5) Make final selections to populate tier. In a handful of cases we brought in related occupations that were not in the SOC taxonomy, such as Ride-share Driver and Owner-operator Truck Driver.

[47]The essence of a career lattice is identifying occupations with similarities across multiple workplace dimensions. It is worth noting that ONET has one of the earliest and best documented approaches to determining occupational similarity captured in their 'career changers' matrix. A 'career changer' in ONET is defined as "related occupations that make use of similar skills and experience [that allow] workers from one occupation to transfer to a job in a related occupation with minimal additional preparation". The Career Changers matrix file contains the top 10 most closely aligned occupations for each ONET-SOC occupation pair based on task - and DWA-based similarity, adjusted by semantic similarities across the ONET alternate titles database. This approach results in groups of similar occupations, albeit often with widely varying educational requirements. The ONET effort stops short of arranging occupations onto a lattice framework.

APPENDIX B

Skill Layering:
A Non-linear Approach to Talent Development

Career progressions are synonymous with life-long skill acquisition. They articulate a vision for upward career and wage mobility. Every career progression starts at some labor market point of entry. The Career Lattices in this project refer to these entry-level positions as Anchor occupations. But for some people an entry-level job can start below an Anchor occupation, including part-time work, gig work, or an unpaid internship.

In truth, individual skill acquisition starts far sooner than one's first job. Early childhood character development and self-regulation provides the groundwork for the subsequent linear path through elementary, junior high, and high school afforded to all Americans. After high school there are many avenues to career success, with someone's personal path being a function of interest, ability, resources, grit, and serendipity. The process of continuous skill acquisition through these multiple sources can be referred to as 'skill layering.'

"A career path is rarely a path at all. A more interesting life is usually a more crooked, winding path of missteps, luck, and vigorous work. It is almost always a clumsy balance between the things you try to make happen and the things that happen to you."

Tom Freston, CEO MTV Networks

Skill layering is a representation of the many ways that an individual acquires skills over a lifetime. The term connotes the continuous addition of new skills throughout a career, with each constituting a new layer of qualification. There is no end to the number of layers that can be acquired, and no restriction to the sources from which a new layer can be added. Not all layers represent the same time or financial commitment, and they are not necessarily linear. In fact, the skill layering concept looks most like a Career Progression Lattice; both are based on skill acquisition, and both reflect a path for life-long learning and upward career mobility.

Ultimately, we are all evolving creatures, adding skills and abilities as we mature. The education community tends to think about skill development as a linear, credential-based process with a focus on getting students enrolled and helping them persist through completion, especially from high school and into college. They routinely work to improve the marketing, enrollment, and support functions to keep students moving toward credential completion.

But in practice, skill acquisition takes place across a broad range of providers, options, and alternatives. It is natural to view skill acquisition as a disjointed and fragmented process. This is certainly true at the individual level. Moreover, basic academic education is fundamentally different from how we think about technical training or how we classify jobs. For some people, getting a college degree is an end to itself, while others view it as a building block to career success. In any case, even when aligned under a career pathway, the world of work and the world of education are fundamentally different in their goals and

underlying paradigms. Thus, it is not surprising that public data collected on learning and employment essentially measure fundamentally different things. While there is nothing inherently wrong with this, it results in a fractured data collection system which is problematic when the goal is improving the alignment between formal education and training programs and the job market.

The fractured nature of the public data system and rapidly changing work requirements has spurred interest in moving beyond occupational titles to consider 'skills' as the primary channel to classify and analyze the world of work. Among the best of these efforts is the common and shared skill library from TSTC's *SkillsEngine*. The transferable skill library from *SkillsEngine* provides the primary building blocks around which the Career Progression Lattices in this study were developed.

The concept of skill layering offers a framework for individuals and public sector stakeholders to understand the learning path that each individual will walk. It provides a framework for each individual to determine their personal course of action or course correction to achieve upward wage mobility. To paraphrase motivational speaker Dan Waldschmidt, the only thing standing between you and outrageous success is your ability to continuously learn new skills. As important, for those who start their careers in a technical discipline or without a higher education credential and who fear they might have a lower ceiling on their earnings potential, the lattices show how current skills, and the acquisition of additional skills can be leveraged to open up higher paying career options.

There are many approaches to convey the talent development process. Scott Adams, business guru and creator of the *Dilbert* comic says that "Most people can – with practice – develop a variety of skills that work well together." He calls his notion a *talent stack.* His thoughts on achieving extraordinary job market success start with becoming the best at one specific thing and becoming very good (top 25%) at two or more things – no matter how long that takes and regardless of the learning approach. His assumption is that the job market rewards skills and abilities that are both rare and valuable.

Everyone has a 'talent stack,' but for many people it is populated by skills that are neither rare (many people can do it) or valuable (lesser demand, not well-paying). The skill layering concept presented here provides a means to frame one's own skills, what skills are learned how or where, and some possible avenues to optimize one's individual talent, marketability, and career trajectory through continuous skill acquisition. The skill layering discussion essentially has four major phases. It is important to note that horizontal boxes depict point-in-time learning opportunities, i.e., over a fixed period of time. Vertical boxes represent learning opportunities that are likely to be continuous throughout an entire career.

Phase 1: Building the Academic Foundation

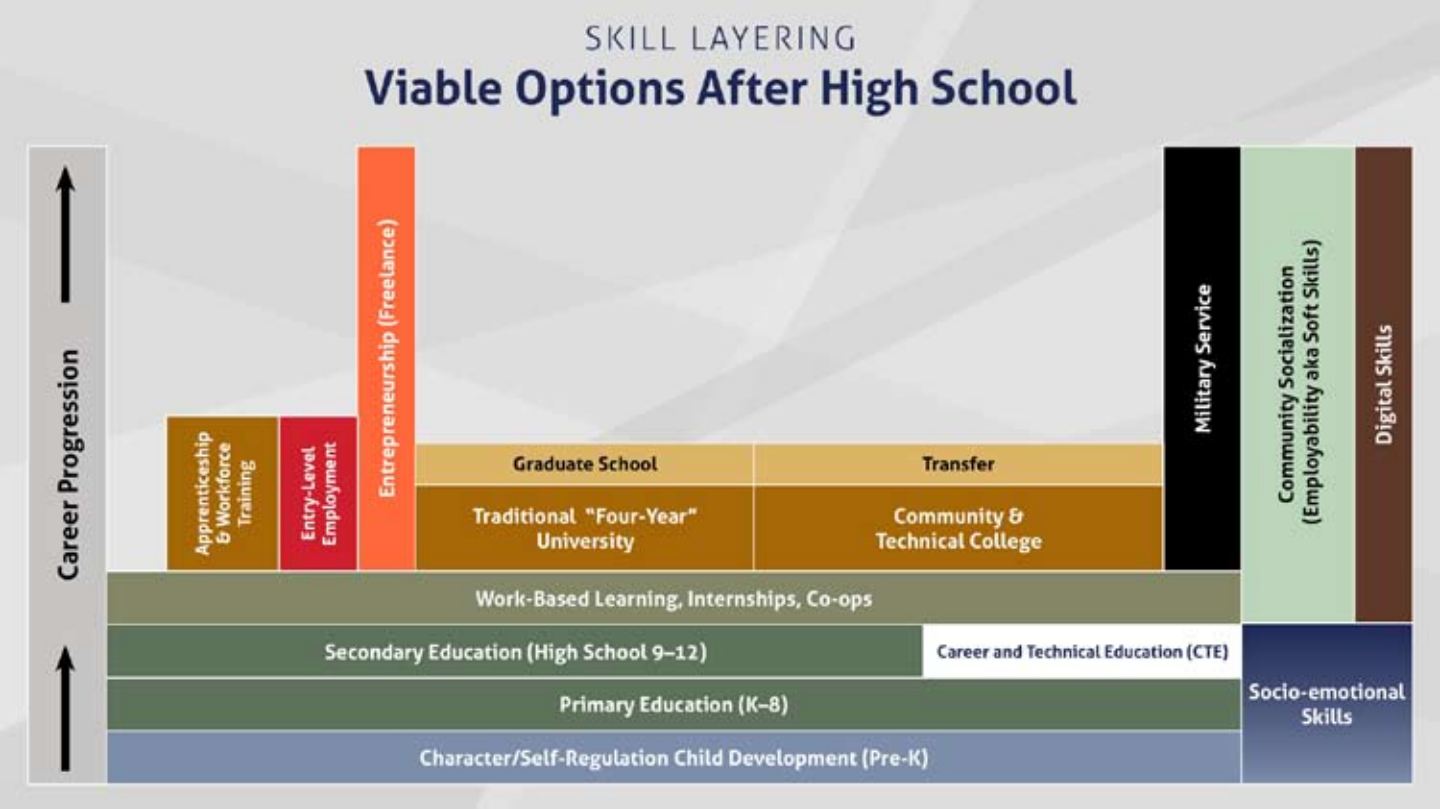
The K-12 academic experience is the cornerstone of skill acquisition. It is the period in which fundamental academic building blocks in reading, mathematics, social science, etc. are formed. Research[48] has shown that educational investments in early childhood character development are critical to long-term success, including improved performance in elementary and high school. But increasingly the academic foundation is more than just general academic education. It includes other dimensions of skills development such as digital skills, socio-emotional skills, and employability skills (a.k.a. soft skills). Acquiring these skills is seldom a function of taking a class or course. In the skill layering model employability skills are listed under the banner of Community Socialization because they are typically learned as part of maturation and life experience. They can come from parents, mentors, non-profit operations such as Scouting America or the FFA, or from the religious community.

Picture a high school student who complements her studies with a variety of other responsibilities and activities. Maybe she walks her younger siblings to their elementary school each morning, demonstrating a knack for caregiving and responsibility. Maybe she works at a part-time job when the school day ends, showing her diligence and drive. And on Saturdays, maybe she participates in a scouting program where she learns to work in groups, become comfortable in nature, or take on leadership responsibilities. Each of these activities is integrated into that persons foundational skill set.

Some students take advantage of dual credit coursework, effectively getting a head start for those that know they will attend college. An increasing number of high school students are taking Career and Technology Education (CTE) courses to acquire practical, occupation-related skills that enhance their knowledge base whether they go to college, enter the military, or go straight into the world of work. Collectively, the knowledge and skills acquired as part of the Academic Foundation is the bedrock for future career opportunity.

[48] How Children Succeed, Paul Tough, 2012

Phase 2: Viable Options After High School



In most high schools there is a push to graduate and encourage students to pursue additional education in college. Indeed, most high schools have a performance measure based on the percentage of their graduates that attend college after graduation. But attending a four-year university is not the only route to career success. There are multiple avenues to career success, and each of them is potentially lucrative and viable for post-high school plans. Sometimes referred to as Alternative Career Paths, there is no single right path for everyone.

The phase 2 diagram depicts six post-high school options:

1. Military Service

Entering military service is a viable career option for many students. The military offers training, discipline, work experience, and benefits that can help pay for additional education after discharge. As important, skill acquisition through a variety of collateral duties is routine and can pay-off when soldiers transition back to civilian life. Many people make military service their entire career, moving up through the internal hierarchy established by their choice of branch of service. Military service is listed as a vertical box because of the option to build a life-long career without leaving the service. It is a separate labor market within itself. However, all of the other vertical routes to skill acquisition, such as employability and digital skills, still apply to those building a career within the military.

2. Community and Technical College

There are many high-paying career opportunities through technical training, the vast majority of which require two years or less of formal instruction. Whether students attend with a

goal of transferring to a four-year university, adding industry-based certifications, or moving directly into the workforce, community and technical colleges offer an excellent, low-cost pathway to career success. Moreover, many technical programs are directly linked to high wage jobs that lead to early career success; some of which pay more than a four-year university degree.

3. Four-year University

Completing a degree at a four-year university is necessary for some professions (law, accounting, economics, etc.), beneficial for others, and generally valuable to acquire a range of critical thinking, problem-solving, and communication skills. University graduates on average are among the highest earners in the job market. But there is considerable evidence that the major field of study is a strong determinant of earnings potential[49] . There are many four-year degrees that have average post-exit earnings which are well-below technical college completers. With the high cost of university attendance those pursuing this option should investigate the potential return on investment by college and major before making this choice[50] .

4. Entrepreneurship

An attractive feature to the gig economy is that you work for yourself. A recent *Business Insider* survey showed that one in three Gen Zer's preferred self-employment. Whether working as a freelance talent, full or part-time, or building a business, entrepreneurship is a viable option for building a career; especially when coupled with various forms of informal skill acquisition.

5. Entry-level employment

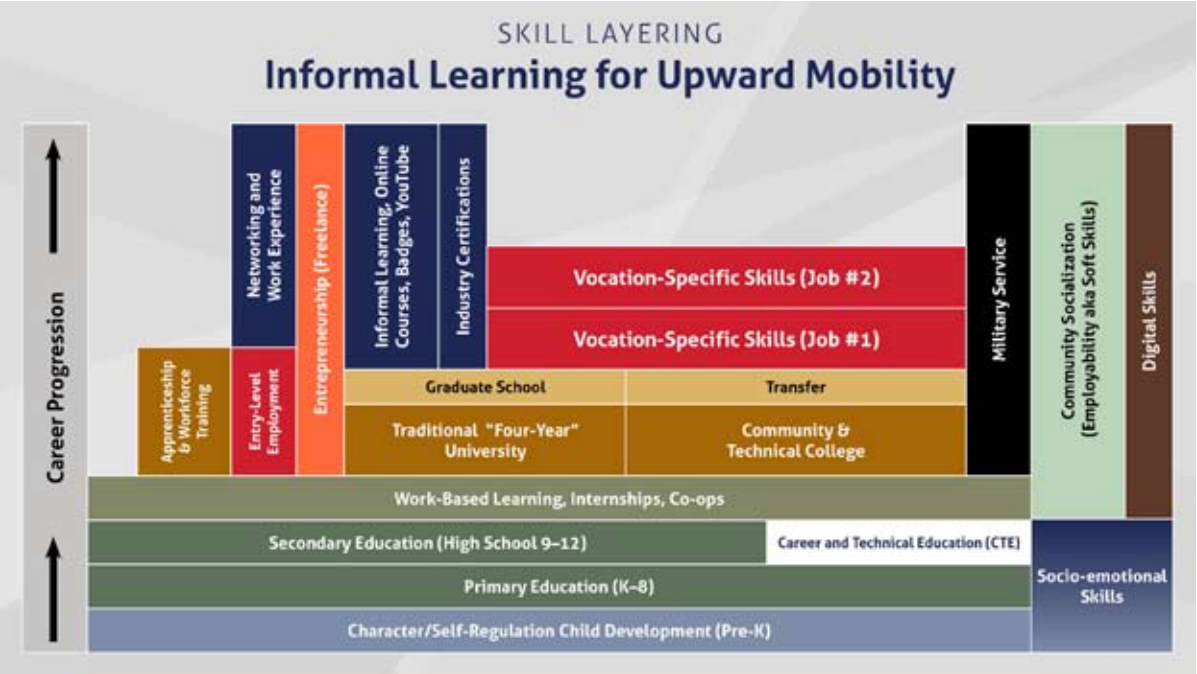
If work experience is highly valued in the business world then getting into the job market as soon as possible is a viable approach. Workers with fewer skills are likely to find themselves in entry-level jobs, but gaining new skills and work experience makes a lot of sense, especially for those uninterested in college. Persons who take this route can benefit significantly from the career lattices, which lay out a path to upward career mobility by leveraging skills, not necessarily formal educational credentials. Some workers gain experience by working with temporary help agencies. This option exposes workers to a wide array of business environments and work roles, while allowing them to pick-up additional skills and gain valuable work experience. Some temporary agencies, such as Express Employment Professionals, provide their labor pool with in-service training in soft skills or working in an office environment[51].

6. Apprenticeship or workforce training

Apprenticeships combine the best of all worlds; academic instruction, on-the-job experience, and the ability to 'earn while you learn'. An increasing number of occupations are covered by apprenticeship programs, so they are no longer the exclusive domain of trade construction. They are the rough equivalent to technical training programs with an internship, and they are growing in support.

[49]Post-exit earnings data by college for different majors can be found at the U.S. Department of Education College Scorecard website at Home | College Scorecard (ed.gov), or at the Texas-specific website for college labor market outcomes at Texas CREWS | Home (txcrews.org).
[50]Many recent college graduates (reported at 40.6% in November 2024) find themselves underemployed working in jobs that did not require a college education. The significance of underemployment for university graduates is documented by the New York Federal Reserve at The Labor Market for Recent College Graduates - FEDERAL RESERVE BANK of NEW YORK (newyorkfed.org)
[51]Express Employment Professionals offers training with badges tagging a worker as *Success Ready, Job Ready, and Office Ready,* that certify soft skills.

Phase 3: Informal Learning for Upward Mobility



The focus of phase 3 in the skill layering framework is on the self-motivated pursuit of knowledge and skill acquisition to move upward on a personal career lattice.

The number of informal learning options has exploded in recent years and were accelerated in response to the COVID lockdowns in education. The characteristic they have in common is that they require personal initiative to engage and benefit from the instruction. Industry-based certifications are growing in popularity with many offering increased recognition as a viable credential of choice. Online platforms like LinkedIn and YouTube offer self-directed video content designed to help individuals master new skills. Massive Open Online Courses (MOOCS) have proliferated such that non-matriculating students can access many college courses.

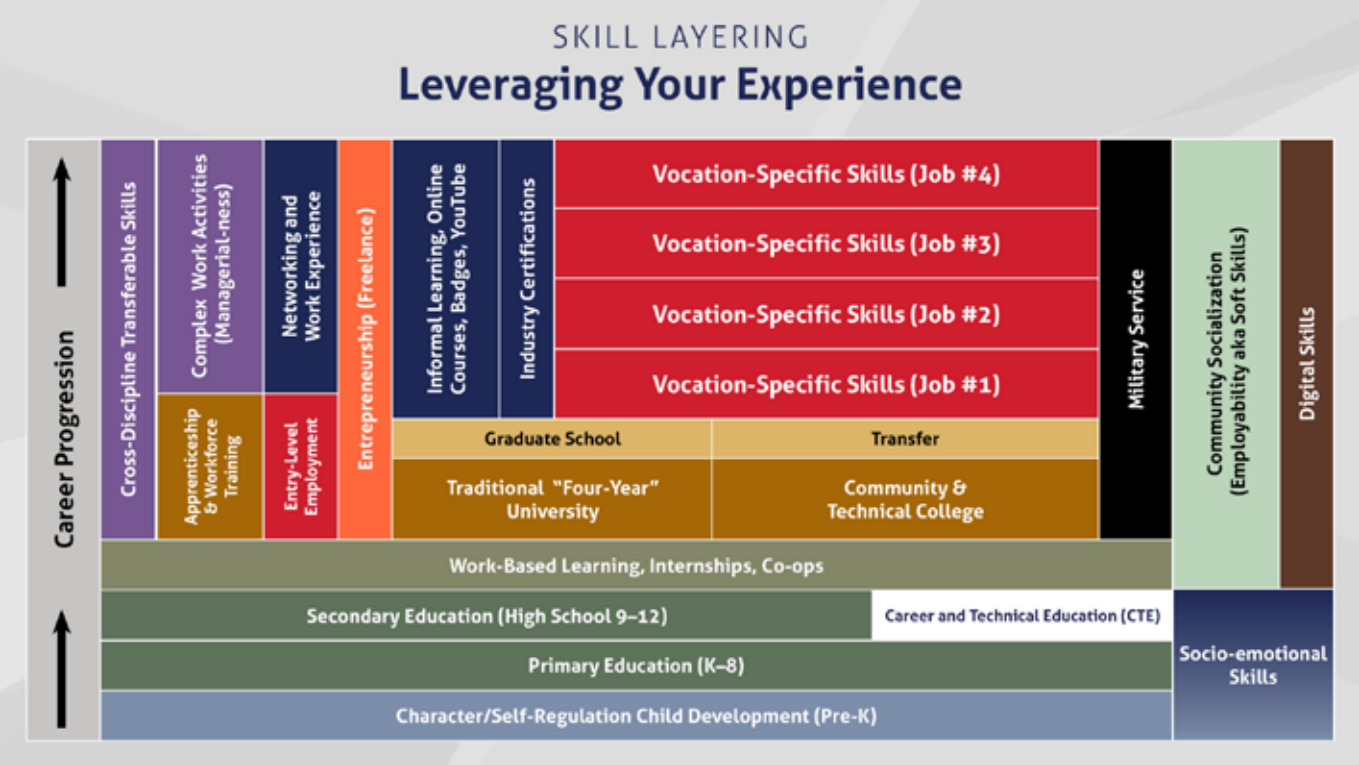
Some courses allow a student to earn a badge or other micro-credential as evidence of content mastery. Skills acquired through all of these options can lead to a better job – likely one which pays more than an entry-level job in the secondary labor market but requires more skills.

Finally, there is no substitute for networking and work experience to build someone's knowledge base and skill set. Social media applications allow access to scholars, pundits, and various accomplished persons from which to learn. Whether looking for a job or tackling a challenging assignment, the infinite ability to connect with others is evidence that there is no end to the number of informal learning options that can lead to skill acquisition and drive upward mobility. In the skill layering diagram, networking and work experience are a ready path to Job #2 which facilitates the jump from entry-level jobs to primary labor market opportunities depicted on a career lattice.
Work experience is becoming the new labor market currency in a skill-based hiring envi-

ronment. It includes work you do before starting on a career path, or as part of enhancing your existing career. Experience gained through work demonstrates to an employer that you've been in similar situations and thus have a greater chance to perform successfully in similar circumstances. If skill-based hiring is to become the norm then the ability to assess skills gained through networking and work experience is critical.

> *"In the business world, everyone is paid in two coins: cash and experience. Take the experience first; the cash will come later."*
>
> Harold Geneen,
> business management guru

Phase 4: Developing a Complete Skill Set



Most skills have an academic foundation[52]. This is certainly true of more highly compensated skills. Basic skills like *Using a flashlight to illuminate work environment* can be done by almost anyone with no academic knowledge nor need for complex problem-solving or critical thinking abilities. It also doesn't result in much pay. Conversely, for example, *Diagnosing and repairing* automotive brakes requires three essential components:

1) an **academic understanding** of how brake systems function within the context of auto systems. This would be a foundational knowledge or intellectual framework critical for a student to understand before successfully engaging in a work activity.
2) the **intellectual curiousity and investigative prowess** to identify where a problem exists. 'Problem solving' requires an ability to apply appropriate inductive and deductive reasoning steps to diagnose the challenge.

3) the **ability to physically replace or repair broken parts** that will fix the problem. These would be terminal objects or performance objectives that are critical to the work performed. These terminal objects might include the skill to identify and use the appropriate tools, select the necessary repair approach, select appropriate replacement parts, and physically uninstall and reinstall defective materials.

Let's explore how these components combine to facilitate the upskilling of an Automotive Mechanic. A person with all three skills is highly valued, well-compensated, and employable. Notice however that unless one has all three skills they are likely not qualified to work as an Automotive Mechanic. For example, one can academically understand how various automotive systems work but has neither the deductive reasoning nor physical endurance to actually repair a brake system. Conversely, one might be able to physically replace a brake pad or grind a rotor, but they require someone else to diagnose the problem. Or, one could have excellent problem-solving skills but no contextual knowledge of automotive systems.

One of the benefits of an articulated career or guided pathway is that all of these skills are embedded at some level within the curriculum. Completers of that curriculum should, in theory, master each of these skills and be qualified for employment.

Workers that did not learn all the skills within a formal guided pathway are strong candidates for upskilling. There are three primary routes within the skill layering framework to facilitate the upskilling of our hypothetical Automotive Mechanic;

1) apply a limited skill set in a lesser-paying, entry-level job (Mechanics Helper, for example) while working in the typical job environment for Mechanics. The Anchor occupations in the Career Progression Lattices are good examples of these entry-level positions which can serve as launching points for better paying roles as new skills are acquired,
2) return to college or technical school and complete a formal training program whose curriculum addresses all three of the critical skills, or
3) acquire these skills through alternate methods such as through the military, workforce training, apprenticeship, or self-directed online study.

The skill layering concept shows that skill acquisition takes place over a lifetime and likely through a variety of alternative learning sources. Thus it is possible for one to develop problem solving skills in high school, pick-up automotive systems knowledge through CTE courses or online platforms, and learn how to manipulate the appropriate tools by working in a related entry-level job.

In a skill-based hiring environment there is more than one way to get qualified for employment. To achieve progressively higher earnings and earn upward career mobility, it may be necessary to acquire some higher order skills. On the skill layering diagram these are reflected as cross-discipline transferable skills and complex work activities, including management skills or managerial-ness[53]. These are employability skills such as leadership, team building, advanced communication skills such as public speaking, or mentoring. They are highly valued and well-compensated in the labor market.

[52]In the world of curriculum development, a terminal objective and enabling objectives deal with whether an objective represents the final goal or a stepping stone toward that final goal. Learning outcomes (performance outcomes) and foundational knowledge deal with what needs to be learned: skill-based or knowledge-based.

"Skill formation is a life cycle process. It begins in the womb and continues on in the workplace. Education policy is only one aspect of a successful skill formation policy, and not necessarily the most important one."

James Heckman

In the context of this Career Progression Lattice project, working in an entry-level job does not relegate someone to being in an entry-level position forever. Because many skills are transferable across occupations (including problem solving and reasoning abilities), any entry level job is connected to multiple higher-paying jobs that are viable with some additional skill acquisition. A Career Progression Lattice is simply a way to graphically depict these relationships by comparing jobs at the skill level. Similarly, the skill layering framework provides the foundation to think about career preparation not as a single choice or a linear movement but rather as a continuous, multi-faceted journey. A key premise behind a skill-based career progression is that upward mobility is not necessarily based on one-time degree or credential attainment. It is a function of continuously growing your skill set around your career aspirations and your level of commitment to labor market success. Every encounter brings an opportunity to add another layer to one's skill profile.

[53]Managerial-ness includes a broad array of responsibilities typically ascribed to a manager such as supervision, delegation, strategic planning, etc.

APPENDIX C

Targeted Occupations Methodology

Constructing Career Progressions Starts with Identifying Target Occupations

There are multiple deliverables associated with the Heart of Texas career progression initiative. The principal objective was to construct career lattices that encompass the Boards Target Occupations list. But Board staff were in the process of revisiting that list when the project started. Thus TSTC project staff had to conduct a regional labor market analysis to identify prospects for an updated project list.

This list plays a pivotal role in the career progressions methodology so that work could not begin until a Targeted Occupations list was finalized. The list of Targeted Occupations is used to focus eligible training investments, but it is often viewed as a focal point for regional education and training collaboration (see TEA Regional Convener Pathway grants), including research projects such as this one. The TSTC team conducted some additional research and suggested new occupations that might be suitable for inclusion in the 2025 list. The following narrative highlights the rationale, methodologies, and ultimate findings from that research.

There are any number of methods that can be used to establish a list of high value occupational opportunities in a regional labor market. Ultimately, there are three unique categorizations associated with regional occupations likely to have high demand and above average job opportunities. These are 'hot' occupations, those with higher-than-average projected growth rates, *'ubiquitous'* occupations, those commonly found across many different industries and regions, and *'critical'* occupations, those that are essential to the operations of a given industry. This analysis attempted to capture the most significant occupations from each category.

Hot occupations are those with above average projected job openings, historical absolute and percentage change, and projected job growth prospects. These are the occupations denoted in most high growth - high wage strategies. These are usually identified using an occupational filtering approach in which the analyst sets parameters across the various labor market indicators and winnows down the list to those that exceed the established thresholds.

Ubiquitous occupations are those that are found across multiple industries and geographies and thus are not necessarily tied to the economic fortunes of a single region or industry. The value of ubiquitous occupations is that those qualified can usually find jobs in their career field regardless of where they choose to live or which industries happen to be growing. Because they are most often linked to a specific set of skills, these occupations tend to have higher formal education requirements. These occupations are typically identified through a combination of occupational filtering and examining industry staffing patterns to find occupations commonly found in many different industries with above average demand[54].

Critical occupations are those that are essential to the operations of growth industries and without which those industries cannot function. Examples of critical occupations might be Electricians or Plumbers in Specialty Trade Construction or Registered Nurses in Hospitals.

This assessment considers all three categorizations using different methodological approaches. This mixed approach was applied to develop a final list of Target Occupations. It primarily relies on an occupational filtering methodology but includes the results of an industry analysis as well. To identify the critical and ubiquitous occupations, one typically conducts an industrial targeting analysis to distinguish likely growth industries and then uses industry staffing patterns to see which occupations are essential to each industry. Such was the basis for this analysis.

The primary methodology was an occupational filters approach which rank ordered HOT regional employment across multiple labor market variables to get a pure rank-ordered, data-driven list of high priority occupations. An industry targeting analysis was also performed to identify occupations critical to key growth industries. The final list was the product of subjective review and local wisdom, but the entirety of the exercise was data-informed.

By definition, an occupational filters approach is deductive, meaning it only allows occupations to remain on a list if they meet all proposed criteria. Thus, for example, once a wage threshold is established at the local level and an occupation pays one dollar less than that threshold, it is eliminated from the list. The occupation might otherwise have high levels of demand, high concentrations of employment in a state or region, significant numbers of online job openings, or be critical to an emerging industry. This limitation suggests the need for subjective review and the use of alternate, albeit complimentary approaches to generate a final list of Target Occupations. This includes the conduct of a subjective review and the consideration of well-documented local wisdom.

Every region has a distinct set of filters based on their size and growth patterns. Occupational labor market data was collected and organized for the six-county Workforce Solutions Heart of Texas region using the JobsEQ platform from Chmura Economics. Projections for the 2023 to 2033 period were extracted and formatted, along with 2023 wage data and online job postings for 2024. Eliminated from the list were occupations requiring only a high school diploma or GED, a PhD or Professional degree, or Master's degree. These occupations were viewed as out of scope for a workforce board. Supervisory occupations were included but Manager occupations were excluded due to the experience issue. As the filtering process proceeded, data thresholds were established and occupations not meeting each threshold were eliminated. Some examples include:

1. Fourteen (14) occupations were eliminated due to 2023 total employment below 10 workers. Later in the subjective phase of the process another eleven (11) occupations were eliminated for insufficient employment.
2. One hundred thirty-nine (139) occupations were eliminated due to below average projected regional growth rate (0.80%).

[54]The process of reviewing scores of industry staffing patterns can be time consuming. Data analysis from the Bureau of Labor Statistics applying the Herfindahl-Hirschman construct to SOC occupations is especially useful for this purpose. See https://www.bls.gov/opub/ted/2014/ted_20140305.htm?view_full

3. Twenty-two (22) occupations were eliminated due to negative historical job growth between 2018 and 2023 only for those occupations that have a location quotient (LQ) of less than 0.80, which indicates they do not hold a regional comparative advantage.
4. Thirty-one (31) occupations were eliminated based on wages per job (less than 80 percent of the regional average or $41,769). The regional average for all occupations is $52,212.
5. An additional twenty-three (23) occupations were eliminated in the subjective review because (a) they have a unique limitation e.g., occupational staffing not typical for a workforce board or low wages, or (b) they represented a next tranche of occupations should the list be expanded. Most of these occupations fell off the list because they barely missed a cut-off threshold or failed only one indicator. Computer and Peripheral Equipment Manufacturing is a good example. Although it ranked #1 in wages per job it ranked #247 in 2023 employment and #251 in 2033 projected employment. With the expansion of this sector in the Central Texas region, it is likely that the employment forecast will undershoot the actual number of jobs. It is the role of local wisdom to understand likely changes in the regional industry structure and anticipate the critical workforce needs.
6. Also eliminated were most occupations that typically require a Bachelor's degree or higher. But occupations in which an Associate's degree could be a qualifying credential such as Registered Nurse and several computer occupations were left in the mix. Given increased skills-based hiring and the persistence of labor shortages, the use of a Bachelor's degree as a hard and fast hiring requirement has diminished.

Ultimately the analysis resulted in a list of 40 Target Occupations. The preliminary recommendations for Target Occupations was forwarded to Workforce Solutions HOT staff for review and comment. In the subjective review, Board staff made a couple of modifications based on their experience working directly with the employer community. Several occupations were removed based on low wage thresholds, while others were added to accommodate existing, successful partnerships. This process of performing a data-driven market analysis that is tempered and informed by local wisdom is consistent with guidance provided by the Texas Workforce Commission.

In addition, two other hybrid (non-SOC) occupations were added to the list based on feedback from the new TSTC WorkSITE training facility. These occupations, Industrial Automation Technician (17-30XX) and Electrical Power and Industrial Systems Technician (49-20XX), each represent a composite of several individual 6-digit SOC codes which individually would not be selected in the filtering process but collectively there is sufficient anecdotal evidence to warrant their inclusion. The final list includes 35 Target Occupations.

[55]An iterative process with HOT staff was used to develop the final list of Target Occupations. In this process several occupations were added based on 'local wisdom' in which staff had strong anecdotal information that an occupation was in demand. Similarly, several occupations were eliminated that had low wages and no local training options. However, the majority of occupations on the list were substantiated by regional labor market data.

Critical Occupations: An Industry Targeting Approach

Every industry has occupations that are critical to their operational success. Thus, to augment the occupational filtering analysis an industrial analysis of the six-county Heart of Texas region was performed. Data for the analysis was obtained primarily from JobsEQ from Chmura Economics[56]. A non-parametric exercise was conducted that ranked each industry across eight key labor market variables.

Recommended Target Industry based on Data Ranking

Industry	Rank Total	Rank EMP 2023	Rank Wages per job	Rank LQ	Rank ABS CHG	Rank PCT CHG	Rank PROJ OPNS	Rank GR/REP Rate	Rank PROJ PCT CHG
Colleges, Universities, and Professional Schools	20.0	3	61	31	1	28	3	34	42
Offices of Physicians	40.0	9	15	109	26	128	11	28	40
Highway, Street, and Bridge Construction	41.1	18	111	13	11	78	22	60	74
Support Activities for Oil & Gas Operations	42.1	72	43	28	28	58	62	9	9
Home Health Care Services	42.8	11	241	50	48	150	6	13	10
Utility System Construction (pipeline, power, sewer)	46.3	40	75	35	30	95	42	36	43
Construction/Farm Machinery/Equipt & Supplies Wholesalers	46.4	22	79	27	5	48	24	103	99
Veterinary & MISC. Professional & Technical Services	49.2	43	109	129	12	42	44	29	34
Building Equipment Contractors	52.7	5	101	76	2	71	9	116	121
Warehousing and Storage	55.5	42	139	184	3	13	32	61	54
Management, Scientific, and Technical Consulting Services	55.7	49	28	207	13	34	56	26	33
Offices of MISC Health Practitioners (optometry, audiology, etc.)	57.0	50	116	151	38	96	49	8	14
Specialty Hospitals (ex.Psychiatric/Substance Abuse	61.0	95	62	66	35	52	97	11	20
MISC Wood Product Manuf. (mobile home, pre-fab wood bldgs.)	64.2	36	90	8	49	125	36	115	104
Insurance Carriers	66.6	23	42	74	47	137	29	104	117
Animal Slaughtering & Poultry Processing	67.6	15	127	9	51	146	10	153	137
Computer Systems Design and Related Services	70.0	73	41	241	29	59	83	6	18
Foundation, Exterior Concrete/Masonry Building Contractors	70.5	19	141	53	88	156	26	98	97
Residential Building Construction	71.4	39	110	132	17	65	48	94	115
Motor Vehicle and Motor Vehicle Parts/Supplies, Wholesalers	72.5	83	53	72	34	63	77	88	83
Pharmaceutical Preparation & Medicine Manufacturing	72.9	41	18	16	229	178	46	44	51
MISC Ambulatory Health Care (bloodbanks, ambulance service)	73.4	112	129	119	27	16	112	16	29
Scientific Research, Engineering & Development Services	75.7	87	146	190	7	1	93	37	57
Waste Collection	76.0	109	99	57	39	44	99	65	63
Offices of Dentists	76.8	64	97	150	59	115	63	52	60
Beverage Manufacturing	78.1	76	108	41	36	68	67	137	109
Veneer, Plywood, and Engineered Wood Product Manufacturing	78.5	111	161	12	33	33	106	79	77
Architectural and Structural Metals Manufacturing	81.5	66	86	51	68	122	68	110	101
Lumber & Other Construction Materials Merchant Wholesalers	81.9	94	81	55	37	54	91	111	102
Building Material & Supplies Dealers (home/Hardware Centers)	86.2	35	166	100	52	132	28	164	139
Retirement & Assisted Living/Continuing Care Facilities	99.4	63	170	140	264	219	47	38	24
Converted Paper Product Manufacturing	109.6	77	92	32	64	110	80	210	212
Computing Infrastructure Providers, Data Processing/Web Hosting	119.4	170	6	238	106	84	174	19	36

[56]Comparisons were performed between Chmura, Lightcast and TWC projections to assess the face validity of each source. Chmura, which is closely tied to the Quarterly Census of Employment and Wages, was selected as the preferred source.

The industry analysis also followed a filtering approach, selecting variables that were reasonable proxies for three types of market demand;

1) projected trends based on industry structure. To understand the education and training needs of a given region it is imperative to understand the industry structure and economic drivers of that region. The most jobs will be created in industries and occupations that already dominate the region.
2) Current market demand-based on the business cycle and job posting activity. Promoting education and training options based on longer term trends and industrial structure are appropriate and defensible and should serve as the foundation of market-responsive curriculum. But it doesn't always capture 'what's hot now'. For this we analyze online job postings and conduct in-depth interviews with regional employers.
3) Occupational demand is likely to emerge in industries and occupations in which most of the current jobs exist. This stems from the fact that most regions have a unique industrial structure that is the result of regional comparative advantage, i.e., retail opportunities around fast-growing population centers or a hospital cluster that grows up around a medical school[57]. But sometimes regions evolve based on exogenous shocks that affect education and training investments. Any given region will have economic development prospects, but it is almost impossible to know which will manifest into actual jobs. In the Waco commute shed, expansions of manufacturing in the industrial park (e.g., WorkSITE training facility) and likely expansion of related suppliers represents an exogenous shock. Such relocations should be considered as major inflections in industry structure and thus warrant an education response that is more fundamental and embedded[58].

Ultimately, thirty-three (33) industries survived the industry targeting process. It is important to note that just because an industry didn't make the final cut does not mean that the industry is not or will not expand nor require more skilled workers. By definition a filtering approach is a prioritizing exercise, and these industries ranked highest among the most important labor market variables.

But what does industry targeting have to do with selecting target occupations? To translate our Target Industries analysis into possible Target Occupations we looked at the occupational staffing for the highest rated Target Industries. The premise is that if we expect these industries to expand, there will have to be job growth in the occupations critical to their operations. Most of the occupations that emanated from the industry analysis had already been identified through the Target Occupations filtering analysis (that's a good thing!). But there were several additions to the recommended list that are critical to key growth industries in the region that performed less well under the occupational filtering approach. These are labeled as *Industry Analysis* under the 'Source' column on the Final Target Occupations list.

[57]This does not mean that skill or hiring requirements, technology knowledge or utilization, or other business practices within industries or occupations will not change over time.
[58]The inclusion of hybrid occupations like Industrial Automation Technician and Electrical Power and Industrial Systems Technician are reflections of emerging industry skill needs.

To identify which occupations meet the definition of 'critical' to the regional economy (defined as closely linked to growth industries and exhibiting independent growth criteria) an industry staffing pattern was applied to each industry to create a list of occupations critical[59] to each of the top 33 4-digit NAICS industries. From this list of occupations, we observed duplicates[60], removed occupations that had less-than-average labor market demand, and those that had education levels inappropriate for this exercise. Although only five occupations were added to the list, the industry targeting exercise was a useful validation of the occupational targeting approach and captured occupations that would not have made the list if it had not been performed.

Just as with supply and demand analysis, regional targeting has a little bit of art to go along with the data science. There is no single right answer, no ultimate ground truth, and no omniscient crystal ball. But this process offers a legitimate and defensible starting point that can be easily augmented with other stakeholder input or local wisdom. It mirrors the occupational targeting process traditionally used by Texas Local Workforce Development Boards. It is based on sound regional economic principles of how job openings occur and how regions develop and grow. It can lead to better understanding the strengths of the regional economy, thus providing a basis for employer engagement and business collaboration. When occupational opportunities are identified through an interconnected industry analysis, or when the time comes for program completers to find jobs, one can follow the same industrial targeting process and identify employer contacts that comprise the targeted industries list and who are thus more likely to have job opportunities.

The Search for Convergent Validity: A Final Target Occupations List

The final process of combining all the statistical evidence is essentially a search for convergent validity. Each of the efforts contributed some understanding of the regional labor market. Occupations identified from the occupational filtering approach comprised the base list. Because the occupational filtering method can eliminate occupations that may otherwise be strong candidates despite failing just one filter threshold, occupations were revisited to see if they should be reconsidered.

Ultimately, local wisdom should always play a part in the development of any Target Occupations list. Namely, there may be other occupations in demand as recognized by regional employers or other key stakeholders that do not show up using data-driven approaches. Rather than exclude regional stakeholder input, Workforce Solutions Heart of Texas staff judiciously considered such feedback, documented the rationale behind any proposed additions or deletions, and created a comprehensive, data-driven list of Target Occupations.

[59]'Critical' in this instance is defined as 1.0% or more of the industry staffing pattern.
[60]Occupations which show up under multiple industries is a good indicator of a ubiquitous occupation.

This list can be used for Workforce Solutions training directives, as a guidepost for the secondary and post-secondary education communities to improve the alignment between program offerings and the regional labor market, and as a foundation for this career progression lattice project.

Final Target Occupations for Workforce Solutions Heart of Texas 2024

Row	SOC	Target Occupations for Career Lattice Purposes	Source for Target Occupation Designation	Competitive Education Requirement 2023
1	49-3011	Aircraft Mechanics and Service Technicians	Local Wisdom	Associate's degree
2	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	Local Wisdom	Recognized Industry Credential
3	49-3023	Automotive Service Technicians and Mechanics	OCC Analysis (tier 3)	Recognized Industry Credential
4	49-2091	Avionics Technicians	Local Wisdom	Associate's degree
5	43-3031	Bookkeeping, Accounting, and Auditing Clerks	OCC Analysis (tier 3)	Some College, No Degree
6	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	OCC Analysis (tier 3)	Recognized Industry Credential
7	13-1199	Business Operations Specialists, MISC (e-commerce, e-security)	OCC Analysis (tier 2)	Bachelor's/Associate
8	47-2031	Carpenters	Industry Analysis	Recognized Industry Credential
9	15-1299	Computer Occupations, MISC (IT project managers, SEO, automation)	OCC Analysis (tier 2)	Bachelor's/Associate
10	15-1232	Computer User Support Specialists	OCC Analysis (tier 1)	Recognized Industry Credential
11	31-9091	Dental Assistants	OCC Analysis (tier 2)	Recognized Industry Credential
12	29-1292	Dental Hygienists	OCC Analysis (tier 3)	Associate's degree
13	49-20XX	Electrical Power & Industrial Systems Technician[2]	Industry Analysis	Recognized Industry Credential
14	47-2111	Electricians	OCC Analysis (tier 1)	Recognized Industry Credential
15	49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	OCC Analysis (tier 2)	Some College, No Degree
16	51-1011	First-Line Supervisors of Production and Operating Workers	OCC Analysis (tier 2)	Some College, No Degree
17	41-1011	First-Line Supervisors of Retail Sales Workers	OCC Analysis (tier 3)	Some College, No Degree
18	11-9051	Food Service Managers	OCC Analysis (tier 1)	Some College, No Degree
19	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics& Installers	OCC Analysis (tier 2)	Recognized Industry Credential
20	53-3032	Heavy and Tractor-Trailer Truck Drivers*	OCC Analysis (tier 1)	H.S Diploma/IND CRED
21	17-30XX	Industrial Automation Technician[1]	Industry Analysis	Recognized Industry Credential
22	49-9041	Industrial Machinery Mechanics*	OCC Analysis (tier 1)	Recognized Industry Credential
23	29-2061	Licensed Practical and Licensed Vocational Nurses	Industry Analysis	Recognized Industry Credential
24	49-3042	Mobile Heavy Equipment Mechanics, Ex. Engines	OCC Analysis (tier 2)	Recognized Industry Credential
25	23-2011	Paralegals and Legal Assistants	OCC Analysis (tier 2)	Associate's degree
26	29-2052	Pharmacy Technicians	OCC Analysis (tier 2)	Recognized Industry Credential
27	31-2021	Physical Therapist Assistants	OCC Analysis (tier 2)	Associate's degree
28	33-3051	Police and Sheriffs Patrol Officers	OCC Analysis (tier 2)	Associate's degree
29	43-5061	Production, Planning, and Expediting Clerks	OCC Analysis (tier 1)	Some College, No Degree
30	13-1082	Project Management Specialists*	OCC Analysis (tier 1)	Bachelor's/Associate
31	29-2034	Radiologic Technologists and Technicians	OCC Analysis (tier 2)	Associate's degree
32	29-1141	Registered Nurses*	OCC Analysis (tier 1)	Bachelor's/Associate
33	29-1126	Respiratory Therapists	OCC Analysis (tier 3)	Associate's degree
34	15-1253	Software Quality Assurance Analysts and Testers	Industry Analysis	Bachelor's/Associate
35	51-4121	Welders, Cutters, Solderers, and Brazers	OCC Analysis (tier 2)	Recognized Industry Credential

*Occupational titles with an askerisk were confirmed through OCC analysis and identified through separate target industry analysis

[1] **Industrial Automation Technician** is a generic title representing 3 occupations with similar skill sets; Electrical and Electronic Engineering Technologists/Technicians, Electro-

[2] **Electrical Power & Industrial Systems Technician** is a generic title representing 3 occupations with similar skill sets; Telecommunications Equipment Installers and Repairers, Electrical and Electronic Repairers, Commercial & Industrial Equipment, and Electrical and Electronic Repairers, Powerhouse, Substation & Relay per separate analysis for WorkSite