Astm a328 steel sheet piling

Language: English Writer: ASTM International title: Article no: STD-60510 Edition: 2007 Approved: 3/1/2012 Page No: 2 Location: ASTM A328/A328M Modified: ASTM A328/A328M Abstract This specification, It covers carbon steel sheet piles of structural quality for use in the construction of dock walls, sea walls, cofferdams, excavations and similar applications. If the steel is welded, a welding procedure suitable for steel and use or service will be used. Steel can be made by any process that produces materials that meet the requirements set out in this specification. Heat or product analysis of steel will be in accordance with the chemical requirements prescribed for phosphorus, sulfur and copper. Tensile test requirements include: tensile strength, yield point and tensile. This summary is a brief summary of the standard referenced. This is not just an official part of the information and standard; the full text of the standard should be referenced for use and implementation. ASTM does not make any warranty or imply that the contents of this summary are accurate, complete or up-to-date. 1. Scope 1.1 This specification covers structural quality carbon steel sheet piles for use in the construction of dock walls, sea walls, kofferdams, excavations and similar applications (see Specification A572/A572M). 1.2 When equipped with steel welding, it should be ed foresized that a welding procedure suitable for the class and purpose or service of steel will be used. For information on resource availability, see Appendix X3 of the A6/A6M Specification. 1.3 The values specified in the units of the pound or in the SI units must be considered standard. In text, SI units are shown in parantheses. The values specified in each system are not fully equivalent; therefore, each system should be used as the other. A consing of values from the two systems may result in this specification not being completed. 1.4 Additional requirements, including additional test requirements and reporting of additional test results, apply to sheet metal piles produced from the coil that are manufactured without heat or furnished only as stress reliever, the A6/A6M Specification applies. 1.5 This international standard has been developed in accordance with the internationally accepted principles for standardization set out in the Decision on the Development of International Standards, Guidelines and Recommendations issued by the Committee on Technical Barriers to Trade (TBT) committee of the World Trade Organization. 2. Referenced Documents (separate purchase) The documents listed below are referenced within the subject standard, but are not presented as part of the standard. ASTM Standards A6/A6M Specification for Rolled Structural Steel Rods, Plates, Shapes and Sheet Metal Pile A572/A572M High Strength Low Alloy Columbium-Vanadium Structural Steel ICS Code Number Code 77.140.70 (Steel profiles) UNSPSC Code UNSPSC Code 30102803(Steel piles) This Standard DOI reference: 10.1520/A0328_A0328M-13AR18 Citation Format ASTM A328 / A328M-13a(2018), Standard Specification for Steel Sheet Piling, ASTM International, West Conshohocken, PA, 2018, www.astm.org Click here for the full version of this document. 2.1. Materials Used in Sheet Metal Pile2.1.1. Sheet Metal Steel 2.1.1.1 Grades. Base Class: ASTM A-328 has been published by the American Association of ASTM A-328 Test Materials which features the basic properties for steel sheet piles in the United States. This class has been satisfactory for many applications, providing a relatively high efficiency point for design and a high ultimate power for drivability. Although welding procedures of this quality have been published or are available to manufacturers, formulation is not very respectable in terms of weldability. Steel is not particularly hard and fractures caused by notches are noted especially in cold environments. This steel minimum yield point has a minimum tensile strength of 39 ksi and 70 ksi. 2.1.1.2. High Strength Rating: ASTM A-572 Higher strength steels are available for sheet metal piles such as astm A-572 series for structural applications. Not all strengths are available from every manufacturer, but the Grade 50 is almost always on sale. High strength grades (1) find the application instead of a lighter section of higher strength for a heavier part of normal strength, (2) to protect safety factors against unmanageable efficiency with the partition module. High strength grades can protect some safety factors against efficiency, where corrosion can reduce cross-sectional properties. High strength steels can often be caused by higher carbon grades. ASTM A-572 Grade 50 minimum yield point is 50 ksi and minimum tensile strength is 70 ksi. Safety factors for high strength steels are similar to their low strength quality. It can now be used as silicone killed, fine-grained formulation with greatly improved Charpy V-Notch effect properties. This steel fracture can be considered for critical applications, (e.g., construction in arctic regions) and impact-subject structures. It's a premium-priced formulation. 2.1.1.3. Corrosion Resistant Quality: ASTM A-690 ASTM-A-690 Quality has been developed to recognize steel specially formulated for sheet metal and H-piles for use in saltwater applications. This quality has shown advantages over regular corrosion resistant carbon steels in the saltwater splash zone, an area of concern. Steel also provides a minimum yield point of 50 ksi and can therefore be designed along the lines of A-572 steels. In some cases the weight can be reduced, so some classes provide a saving that will pay additional cost. Further discussion of this material is given on 17.4.4.1. 2.1.1.4. Structural Factors of Safety for Steel Sheet Pile Sheet piles are designed using stress design methods that are still allowed; therefore, a safety factor that reduces stress, which can be allowed in the heap from yield stress, is usually indicated. Equation 2-1: βallow = Freduction βy where βallow = Material Freduction = Safety βy reduction factor = Material efficiency stress, psi or kPa with pure bending steel pile (see below), two reduction factors are used: for static loads, the reduction factor for permanent jobs is usually 0.65% or 65% of stress yield stress that can be allowed. For the notes listed above: ASTM A328: βallow = (0.65)(39) ≈ 25 ksi ASTM A572, ASTM A690: βallow = (0.65)(50) ≈ 32.5 ksi For earthquake loads, the reduction factor is usually (1.33)(0.65) 0.87 ≈ or 87% of the stress efficiency stress that can be allowed. The use of this increased value for earthquake loads predicts a static analysis to insure that the static situation is not actually the management state of a particular situation (see Example 19). For the notes listed above: ASTM A328: βallow = (0.87)(39) ≈ 34 ksi ASTM A572, ASTM A690: βallow = (0.87)(50) ≈ 43.5 ksi 2.1.2. Other materials used in sheet pile Aluminum is usually the same as other extrusion aluminum shapes. Material specifications can be obtained from manufacturers and are also discussed extensively in Pile Driving by Pile Buck. Also discussed more extensively in the same book is wood; Greenheart wood, for example, has excellent material properties. Vinyl and pultruded fiberglass stacks are made from materials whose properties vary greatly from manufacturer to manufacturer. Therefore, it is critical to the properties of these sections to verify both the mechanical properties and the method in which these mechanical properties are obtained. Also note that with both of these materials, the application of these material properties is subject to many factors, such as creep (in the case of vinyl sections) and bunking and localized bending (with both of these materials). 2.2. Sheet Metal Pile 2.2.1 Bending. Pure Bending Theory of sheet metal Coating The primary object for structural analysis of sheet metal piles is to analyze failure due to excessive bending moment and stresses. Most of the analysis of cantilever and anchored walls includes pure bending calculation. In the case of pure bending, the maximum allowed bending moment is specified as Equation 2-2: Mallow = Smin σ allowed σ mallow = Allowed bending moment Smin = Minimum Section Module Both allowed bending moment and partition module, striped foot or wall per meter. The strength of layer stacking against bending is a combination of the shape of the section and the material made outward. The allowable stress of the material is a function of the material itself. 2.2.2. Bending Application to Certain Sheet Metal Pile Sections The century-long development of sheet metal stakes, all kinds of departments. They're constantly changing; Although Pile Buck is available in both printed and online form, this is a table that is beyond the scope of this book. However, for the purposes of the sample problems in this book, we will use several commonly used sections that have been made of steel for many years. These are shown in Table 2-1. 2.2.3. Combined Axial and Flexural Stresses can also experience axial loading from sources such as sheet metal piles as well as upper concrete pile covers, axial forces due to the vertical component of the sloping anchor, and soil friction. Especially with pile covers, this sheet can cause bending in the pile. This equation can be calculated by changing 2-2 and solving it for maximum (or permitted) stress: Equation 2-3: βmax = Paxial + Mmax + Paxial (βmax + ep) < σ A axial Swall is allowed where Mmax = coating Paxial maximum moment = axial coating Axial = area of coating subject to axial loads βmax = maximum deviation of coating epinin = eccentricity of the load from the center line of the coating Loading on such sheet stacks is particularly IMPORTANT and demsonstrated in Example 24. Equation 2-4: Mmax > Paxial (βmax + ep) 10 2.2.4. Section Module U-Shaped Coating As mentioned above, the section module is definitely a function of the physical shape of the material; However, with steel plating, Larssen and Z-shapes have been included in a long running difference between European and American applications. Larssen and other U-shaped stakes remain popular in Europe and the Far East, but have been displaced in the US by the Z-type profile. Why? At the heart of the problem is a difference in engineering philosophy. As we have said before, sheet pile walls are considered to act as a beam. For most shapes, the neutral axis falls halfway between the two outer sides of the coating, similar to the H-beams. While the line of locks with the Larssen wall falls on the neutral axis, it is not for the Z-wall. Since the beginning of the Larscen-type stack, which ticks each other along the neutral axis of the wall, interlocks have been concerned about the ability to transfer horizontal cutting, without which full section strength cannot be improved. European philosophy has been very liberal in this regard, and you will find that the section module published for larssen shapes is always based on full transfer or a reduction from this situation left to the engineer. Since most American engineers have taken a more conservative approach and these transfer joints cannot be counted upon without welding, it is assumed that the cross-sectional module of a wall with locks on the neutral axis should be based on single pile properties rather than the combined pile system. Of course it's philosophy. Development of Z-type shapes that are intertwined on the faces of the wall with horizontal cutting zero. Realistically, there is always an overall agreement that there is some constantity reached in interlocks, changing downwards by 100 percent. The American approach is often a major safety factor many times and has resulted in une economical use of the material. The European method may have produced some marginal security factors from time to time, but apparently very few real errors have been documented. A number of belt sheet stacks at shallow depth have been developed by the cold finishing industry. These sections, for the most part, are away from the neutral axis, interconnected city with neighbors on the face of a wall. The questions asked in the paragraph above do not apply to these shapes and can be used in a similar way to the published section module Z shapes. 2.2.5. Bug Bending Is a relatively newly recognized error in sheet metal pile. It interacts with classic bending, but it is a separate error mode of its own. As we have seen, sheet metal pile loads are primarily developed by lateral soil pressures, in turn improve beam scissors, moment, rotation and deviations. In addition to flexural loading developed along the axis of the sheet metal stack, these pressures act directly on the coating, producing a overlay as shown in Figure 2-1. In essence, the lateral pressure sheet is plane; Bending the corners is the coating resistance to this plane of the plate. This bending is independent of the classic flex, but even if the classic flex predicts the other way, the combined stresses can exceed the limit of the material. Figure 2-1: Section One of the PZ-27 (after Hartman) Section Of The Bending Of The Neck Click here for a full version of this document. Here.